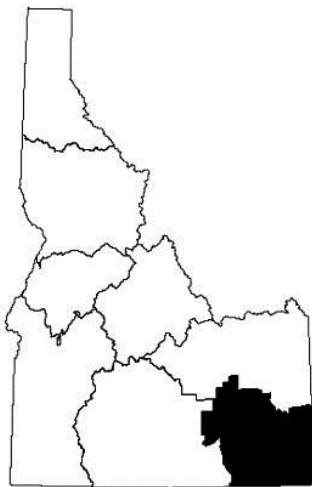




**IDAHO DEPARTMENT OF FISH AND GAME
FISHERY MANAGEMENT ANNUAL REPORT**

Virgil Moore, Director



**SOUTHEAST REGION
2016**

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LOWLAND LAKE AND RESERVOIR INVENTORIES AND SURVEYS

ABSTRACT

We sampled American Falls Reservoir during the first week of August 2017 via gillnets and shoreline electrofishing. Our findings show that multiple year classes are present for both Smallmouth Bass *Micropterus dolomieu* and Rainbow Trout *Oncorhynchus mykiss* which should provide excellent angling opportunities for the next several years. We surveyed Treasureton Reservoir in June 2016 by shoreline electrofishing. Our results show few trout are recruiting to the fishery largely due to predation by illegally introduced Largemouth Bass *Micropterus salmoides* (LMB). Therefore, we recommend chemical renovation of the reservoir the next time reservoir storage is low. Hawkins Reservoir was also stocked illegally with LMB sometime in the recent past. We treated the reservoir with 150 gallons of Prentox Prenfish (rotenone piscicide) in September 2016 to remove LMB. We resumed stocking fish there three weeks following treatment. We plan to evaluate the success of the treatment in 2017.

American Falls Reservoir

Introduction and Methods

American Falls Reservoir is located in Bingham and Power counties on the Snake River in southeastern Idaho and is the largest irrigation storage reservoir in Idaho (Figure 1). The dam was completed in 1927. The reservoir covers 22,663 ha and contains 2,097 km³ of water at full capacity. The reservoir is primarily used for irrigation storage. The U.S. Bureau of Reclamation owns and manages the dam and reservoir. Refill typically begins in October and continues through winter and early spring. Final fill is during the spring runoff. Irrigation starts in April or May, and drawdown starts as demands exceed inflow. Deteriorating concrete in the dam resulted in storage restrictions during the period 1976-1979. In 1979, a new dam was completed, and the original level to active storage (1,327 m above mean sea level) was restored. The new dam and power plant allowed more water to pass through the turbines, increasing electrical production. American Falls Reservoir (AFR) provides varied sport angling opportunities. Smallmouth Bass *Micropterus dolomieu* were stocked in the 1980s and by the mid-1990s the population had grown enough to provide substantial angling opportunities. Yellow Perch *Perca flavescens* are also found in the reservoir and most angler harvest occurs during the winter ice fishery. In 2016, hatchery raised White Sturgeon *Acipenser transmontanus* were stocked in the reservoir for the first time. It is unknown if they have contributed to the fishery. Hatchery Rainbow Trout *Oncorhynchus mykiss* (RBT) are stocked annually and provide the bulk of the angling and harvest opportunities. The objective of this project was to assess the status of both the SMB and the RBT population found in the reservoir.

During the summer of 2016 we sampled AFR with gillnets (floating and sinking) and shoreline electrofishing. Gillnets measured 42 m x 2 m with six panels composed of 19, 25, 32, 38, 51, and 64 mm bar mesh. The combination of one floating and one sinking net, fished overnight equaled one unit of gill net effort. Overall, we applied 3 units of gillnet effort. We also sample fish using boat mounted electrofishing equipment utilizing standard pulsed DC waveforms. One unit of effort equaled one hour of electrofishing. Overall we attempted to apply three units of effort. However, during our last survey the timer malfunctioned on our electrofisher unit and was not discovered until the sample run ended. Therefore, we only report size structure results here.

All fish captured were identified, enumerated and measured to the nearest mm (Total Length, TL). No weights were recorded because the reservoir was too rough during the survey period to collect accurate data.

Results and Discussion

Gillnets were set at three locations on AFR on 2 Aug 2016 and 3 Aug 2016 (Figure 1). Non-gamefish dominated the catch and comprised 66% of the total catch. Utah Suckers *Catostomous ardens* were the most common followed by Utah Chubs *Gila atraria* and Common Carp *Cyprinus carpio* (Table 1). Rainbow Trout and SMB comprised 34% of the remaining catch with SMB being the most abundant (25%, Table 1).

Rainbow Trout appear to be recruiting to the fishery annually. The RBT captured in gillnets ranged from 302 mm to 550 mm TL with a mean of 432 mm TL. Analysis of the RBT length frequency distribution shows several cohorts present during the sample period, which suggests angling opportunities should be good for the next few years (Figure 2).

Smallmouth Bass dominated the electrofishing catch. Overall, we captured 199 SMB ranging in size from 112 mm to 483 mm TL. Similar to RBT, the length frequency distribution of SMB shows multiple year classes of fish present at the time of the survey. The current size structure of SMB has improved over sizes observed in the late 1990s (Figure 3). However, SMB PSD (25) remains below the desired range of 40 - 60 (Anderson and Neumann 1996).

American Falls Reservoir has been managed under the general bass rule (6, none under 12") for decades. In January 2016, this regulation was changed to 2 bass, any size. The Snake River below AFR has been managed under this regulation since 2008. The SMB fishery found there is performing well and had a PSD of 53 in 2016 (See Snake River, this report). We think the AFR SMB fishery will respond similarly to the regulation change.

Treasureton Reservoir

Introduction and Methods

Treasureton Reservoir is a small irrigation reservoir located about 10 miles north of Preston, Idaho. The reservoir has a surface area of 58 ha and an average depth of less than 6 m. The reservoir was chemically treated in 1989 to remove nongame fish. Only trout have been stocked since. Trout stocking has been primarily sub-catchables (fish < 254 mm long). The average number of trout stocked in the reservoir is about 15,000 annually (Figure 4). The vast majority of those fish have been Rainbow Trout (95%; *Oncorhynchus mykiss*), with Cutthroat X Rainbow Trout *O. mykiss* X *O. clarkii bouvieri* hybrids making up the remainder. Hereafter, I will refer to these species collectively as trout.

The fish management objective for Treasureton Reservoir has been to provide anglers with an opportunity to catch quality and trophy-size trout. That goal has largely been achieved using conservative harvest rules including reduced bag limits and a variety of size restrictions. Current fishing rules include a 2-trout limit, with none under 20 inches, and no bait.

In addition to conservative harvest rules, stocking sterile (i.e. triploid) rainbow trout has positively affected the fishery. In the late 1990s, a research study completed at Daniels and Treasureton reservoirs showed that sterile trout could live longer and achieve a greater overall size (Teuscher et al. 2001). Because of that study, most of the trout stocked in Treasureton Reservoir have subsequently been sterile.

Unfortunately, sometime during the mid-2000s, Largemouth Bass *Micropterus salmoides* (LMB) were illegally introduced. It is likely that the introduction of LMB at the reservoir has negatively impacted the trout fishery. Therefore, the objective of this study was to determine if the LMB have reduced survival and growth of Trout.

An electrofishing survey was completed on Treasureton Reservoir in the spring of 2016. Boat mounted electrofishing gear using standard DC waveforms was used to conduct the survey. The survey was completed between 2100 and 0400 hours. All fish captured were anesthetized, measured for total length (TL; mm), weighed (g), and released.

Results and Discussion

The electrofishing survey was completed on 10 May 2016. We captured a total of 78 trout and 159 LMB. Electrofishing catch per unit effort (CPUE) of trout and LMB were 98 fish/hr and 398 fish/hr, respectively (Table 2). The trout captured had a mean length and weight of 516

mm and 1,679 g, respectively. These trout also had a mean Relative Weight (W_r) of 97 (Table 2). Largemouth Bass collected from the reservoir had a mean length, weight, and W_r of 219 mm TL, 192 g, and 107, respectively (Table 2).

Since 2010, changes in length frequency distribution have occurred for trout and LMB. The length frequency distribution of trout showed a wide range in sizes (Figure 5). In 2016, very few smaller trout were observed which suggests survival of trout stocked the previous two years was low or that many of these fish were preyed upon.

Conversely, the length frequency distribution of LMB went from few individuals and cohorts observed in 2010 to many in 2016 (Figure 6). Similarly, CPUE for LMB went from a low of 10 fish/hr in 2010 to 398 fish/hr in 2016 (Table 2). During the same time frame, LMB W_r went from a high of 142 in 2010 to a low of 107 in 2016 (Table 2). These results are indicative of a LMB population that is increasing. Furthermore, the composition of the fishery has also changed. In 2008, trout were the only species found in the reservoir. Since then, trout relative abundance has declined. In 2016, trout comprised only 10% of the total catch while LMB comprised the remaining 90% (Figure 7).

As mentioned above, one reason for the paucity of small trout in the 2016 sample may have been due to predation by LMB. To test this hypothesis, we returned to Treasureton Reservoir in June 2016 to collect diet information on LMB. Prior to our sample dates, approximately 12,200 fingerling RBT (< 152 mm TL) were stocked into the reservoir. The LMB collected for the diet study were all over 280 mm in total length (TL). We selected this size range to ensure that fish used in the study had made the transition to piscivory. We used the same electrofishing methods to collect LMB. All LMB collected of the appropriate size were immediately sacrificed and their stomach contents examined. We assigned stomach contents to one of three categories: Trout, Other, or Empty.

Overall we collected 36 LMB during 14, 16, 21, and 23 June. Fifty six percent of the stomachs examined were empty. Of the remaining stomachs that contained prey, about 81% contained RBT fingerlings. The number of RBT in the diet of LMB was highest during the first two sampling events but was lower during the last two. These results suggest that either RBT were less abundant later in the month or they became acclimated to the reservoir and therefore were less likely to be preyed upon. We suspect it was the former since fewer RBT were observed during the last two electrofishing surveys than were observed during the first two. Furthermore, since RBT were observed in the majority of stomachs examined that contained prey, we think LMB predation is limiting RBT recruitment to the fishery (Figure 5).

In summary, Treasureton Reservoir has been a successful trophy Trout fishery. To maintain that unique trophy Trout fishery, we have encouraged LMB harvest (no bag limit or size restrictions) and have transported LMB to other fisheries specifically managed for them (Condie and Johnson reservoirs). Those actions have not been enough to moderate the growing LMB population. Adult LMB are very effective predators on Trout, while young bass compete with Trout for food. Without significantly reducing the LMB population, competition for food and direct predation will further impact the Trout fishery. Largemouth Bass between 355 and 406 mm are becoming more abundant and will prey on newly stocked Trout. As the number of young LMB grows, food resources will become more limited and Trout growth will be slowed.

Based on previous public input, reflected in the current 2013-2018 Fish Management Plan, Treasureton Reservoir is managed to provide a trophy trout fishery. This fishery generates from 2,000 to about 3,500 angler trips per year. Treasureton Reservoir's trophy trout population

is unique to the area; while other waters nearby provide a diversity of LMB, Bluegill *Lepomis macrochirus*, Black Crappie *Pomoxis nigromaculatus*, Yellow Perch *Perca flavescens*, and put-and-take RBT angling opportunities. The popular fishery for large trout cannot be sustained without improved survival of stocked hatchery trout and a reduction in the LMB population. If the majority of anglers would prefer to maintain Treasureton Reservoir as a trophy trout destination, this would best be accomplished without LMB present in the lake.

We have identified three potential management approaches that could be applied to Treasureton Reservoir:

1. Remove Largemouth Bass with chemical piscicide (rotenone) in the fall. That treatment would kill all the fish in Treasureton Reservoir. Prior to completing a treatment, the reservoir would be placed on salvage fishing rules to allow anglers to remove as many trout and LMB as possible. While under a salvage rule, there are no limits, bait, or size restrictions. Rotenone would be applied in the fall after the irrigation season is over. About 2 weeks following treatment, the reservoir would be planted again with hatchery trout. Based on past growth rates, those trout would be 356 to 381 mm by the following spring, and from 381 to 457 mm by fall. Within 18 months, we expect trophy trout over 508 mm would return to the fishery. This option has the highest chance of success to maintain the trophy trout fishery.
2. Complete a three-year experiment to control Largemouth Bass expansion by removing fish using intense shoreline electrofishing. Electrofishing removal effort would occur in the spring and fall of year. This option is possible because of Treasureton's small size, but would not be possible in larger reservoirs. During the three-year experiment, LMB and trout growth information would be collected. Chances of success with this option are uncertain. At the end of three years, a summary report would be completed with recommendations to continue or change management direction.
3. Take no action. This option allows the LMB population to grow without active management. This option would result in poor trout growth and eventually a stunted LMB population. We expect results to be similar to what occurred in Deep Creek Reservoir when that reservoir contained exclusively LMB and trout. Low numbers of larger-sized trout would be stocked to avoid predatory LMB and birds. With low growth rates and lower numbers of trout stocked, trout angling quality might be fair or average. The long-term outcome would be loss of the unique trophy trout fishery and a mediocre bass fishery.

Regardless of the management option implemented, in the short term, larger trout will be stocked in the fall of 2017 to minimize predation by birds and Largemouth Bass.

Hawkins Reservoir

Introduction and Methods

Hawkins Reservoir is located in Bannock County near the city of Arimo, Idaho. The reservoir is situated at 1,576 m ASL and covers about 22 hectares at full pool. The reservoir provides angling opportunities for hatchery produced Rainbow Trout (RBT) *Oncorhynchus mykiss* and Rainbow X Cutthroat Trout *O. mykiss* X *O. clarkii bouvieri* hybrids (trout).

In 2009, Largemouth Bass (LMB) *Micropterus salmoides* were sampled from the reservoir for the first time. Based on the size structure of these fish, we suspect this illegal introduction occurred sometime during the mid-2000s. The presence of LMB in the reservoir has resulted in slowed growth and catch rates for trout. Furthermore, the presence of LMB in the reservoir runs counter to our management objective of a monoculture put and take trout fishery. Therefore, the objective of this project was to remove LMB from Hawkins Reservoir using the piscicide Prentox Prenfish Toxicant (2.5% rotenone).

We applied Prentox Prenfish Toxicant (product) to the reservoir by boat and a gas powered Venturi pump (Finlayson 2000). Full barrels of product were loaded onto the boat and the Venturi apparatus was attached. We then proceeded over the reservoir in a grid pattern to disperse the product as evenly as possible. We operated the boat at about 5 mph while applying the product. We also treated two spring seeps connected to the reservoir several times with backpack sprayers. These sprayers contained a mixture of water and product at a ratio of 10:1. The inflow creek was treated with a continuous drip station for approximately 18 hrs. The mixture in the drip container was formulated to deliver a continuous concentration of 3 ppm. See Brimmer et al. (2011) for a complete description of the drip cans used at Hawkins Reservoir. Sentinel fish were used to test reservoir toxicity following the treatment. Two sentinel RBT were placed in each of the three cages and deployed so each cage was suspended about 0.5 m off the bottom. We placed the sentinel cages at the west, center, and east areas of the reservoir. During each trial, the fish remained in the cages for at least 24 hours before they were checked.

Results and Discussion

Prentox Prenfish Toxicant was applied to Hawkins Reservoir on 27 September 2016. We followed the Prentox Prenfish Toxicant label instructions and applied 150 gallons of product to achieve a final concentration of 3 ppm in the reservoir. The total of 150 gal of product applied during the treatment included what was applied to the reservoir and what was used in the sprayers and drip cans. The boat application process took about 2 hours to complete and required a crew of six people. The two spring seeps were treated with product several times during the day and the inflow creek was treated continuously for about 18 hrs.

During and following product application, both LMB and trout appeared to be affected. Large numbers of dead and dying fish were observed around the reservoir. Dead fish were left onsite to decay naturally.

Following treatment, sentinel RBT were deployed on three separate occasions. A total of six fish were deployed on 12 October (Trial 1), 19 October (Trial 2), and again on 26 October (Trial 3). No fish survived the first two trials but all RBT survived the last trial. Fish stocking resumed following the last successful trial.

MANAGEMENT RECOMMENDATIONS

1. Chemically treat Treasureton Reservoir to remove illegally introduced Largemouth Bass population and restore the Rainbow Trout fishery.
2. Evaluate the success of the Hawkins Reservoir rotenone treatment.

Table 1. Species composition of fish collected from American Falls Reservoir, Idaho, during August, 2016.

Species	<u>Gill net</u>		<u>Electrofishing</u>	
	No. Caught	% Composition	No. Caught	% Composition
Smallmouth Bass	73	25	199	82
Rainbow Trout	27	9	3	1
Utah Sucker	108	37	36	15
Utah Chub	42	15	0	0
Carp	40	14	6	2
Totals	290	100	244	100

Table 2. Catch-Per-Unit-Effort (CPUE) and Relative Weight (W_r) of Largemouth Bass (LMB) and trout sampled from Treasureton Reservoir, Idaho, in 2010, 2011, and 2016.

	<u>CPUE</u>			<u>W_r</u>		
	2010	2011	2016	2010	2011	2016
LMB	10	134	398	142	122	107
Trout	66	66	98	93	119	97

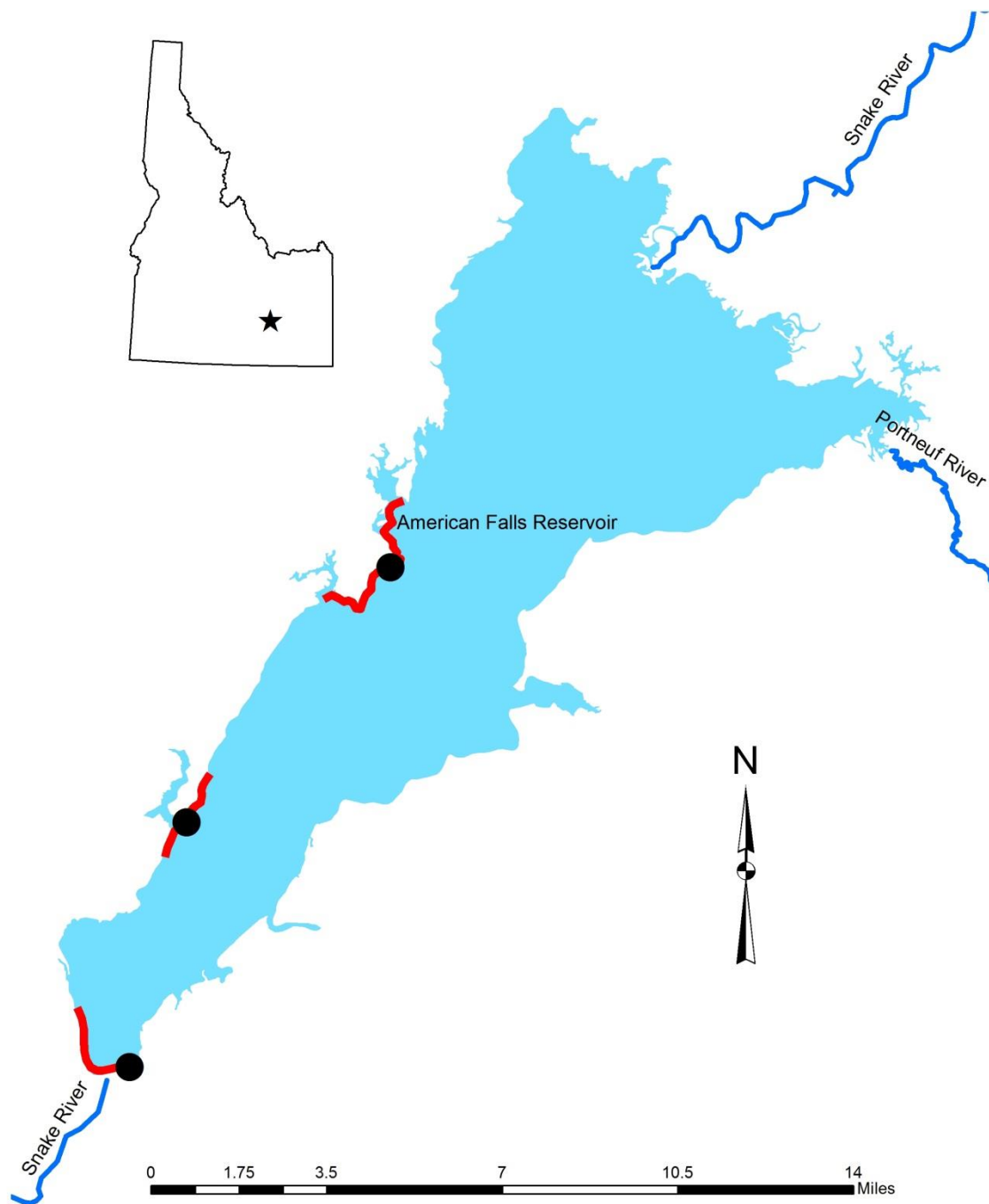


Figure 1. Fish sampling locations for American Falls Reservoir in 2016. The red lines indicate electrofishing transects and the black circles represent gillnet locations.

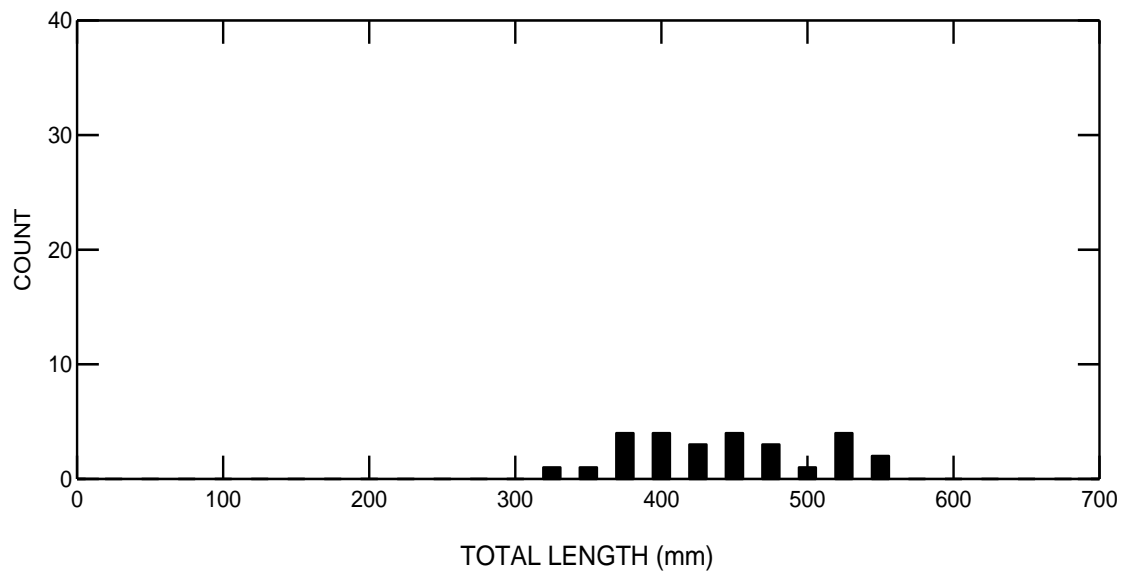


Figure 2. Length frequency distribution of 27 Rainbow Trout collected from American Falls Reservoir, Idaho, during August 2016.

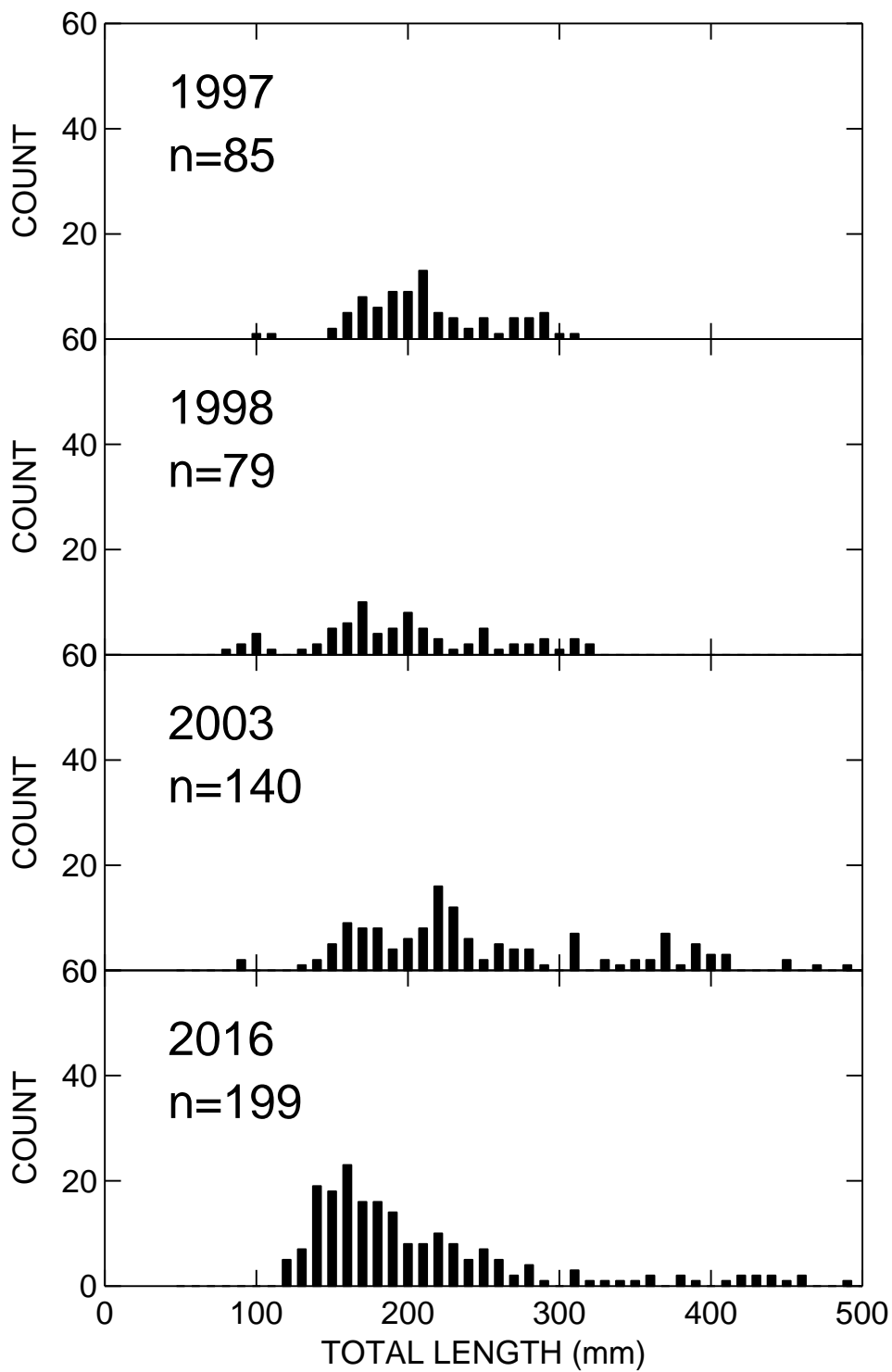


Figure 3. Length frequency distribution of Smallmouth Bass collected from American Falls Reservoir, Idaho, via electrofishing during 1997, 1998, 2003, and 2016.

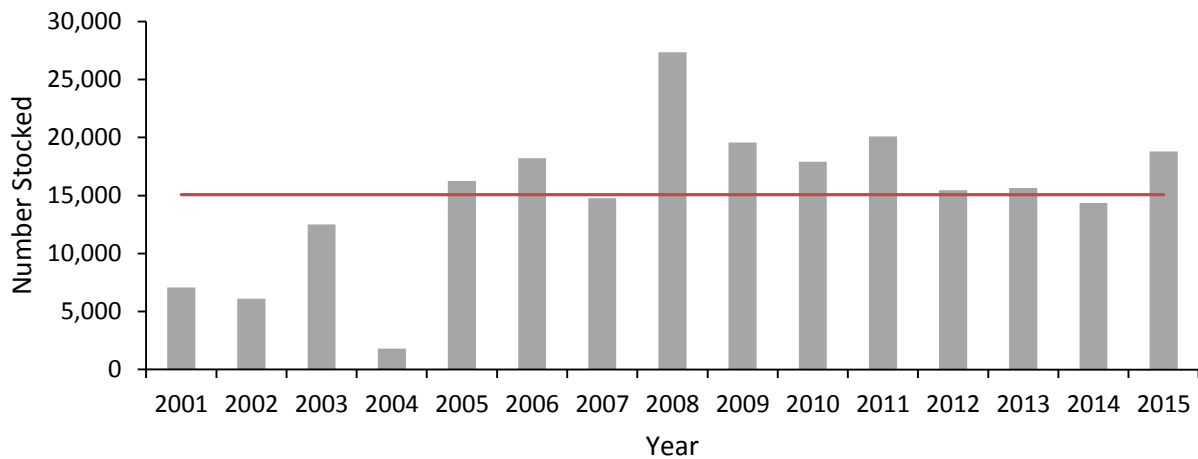


Figure 4. Number of trout stocked in Treasureton Reservoir since 2001. Stocking effort has been relatively constant since 2005. The horizontal line shows the overall average number stocked (about 15,000).

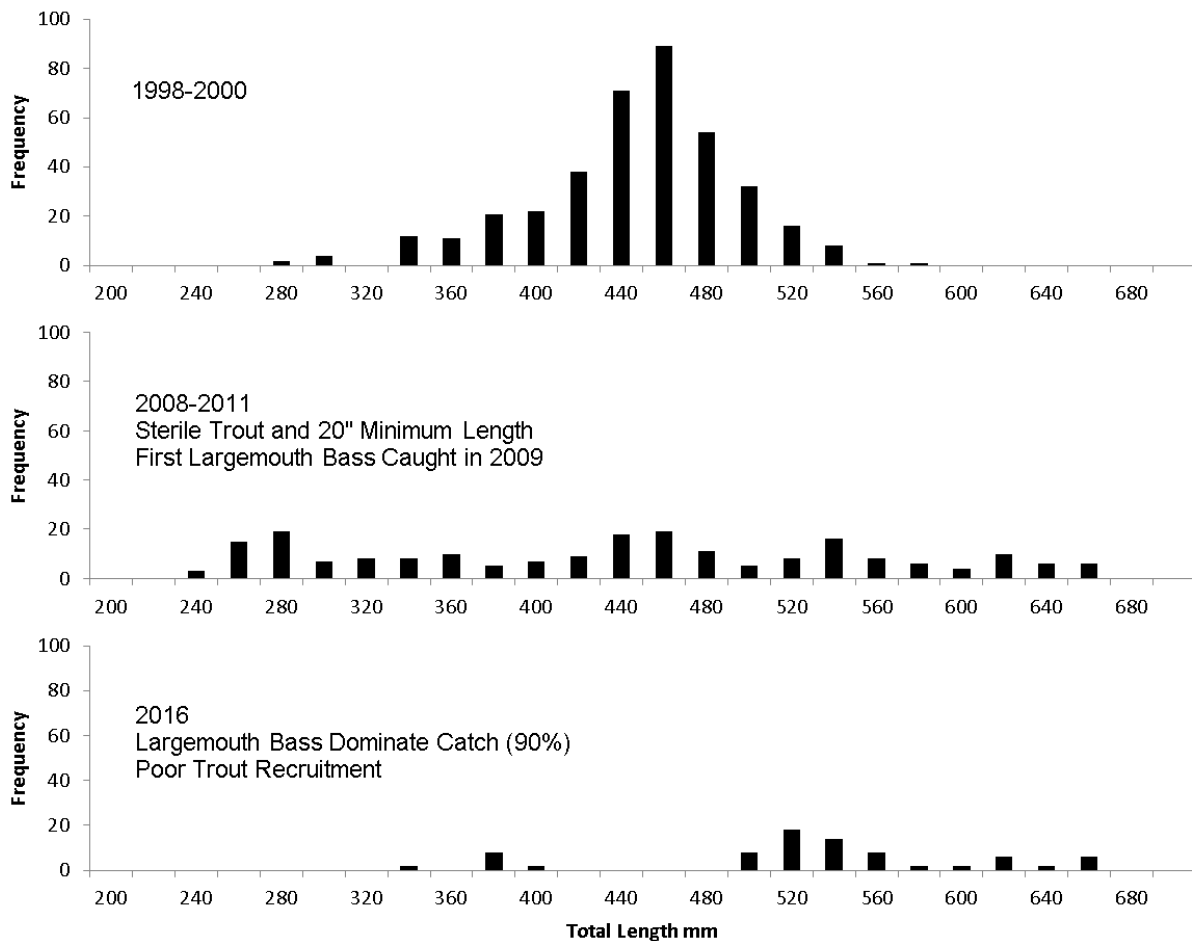


Figure 5. Size distributions of Trout caught during various electrofishing surveys on Treasureton Reservoir, Idaho.

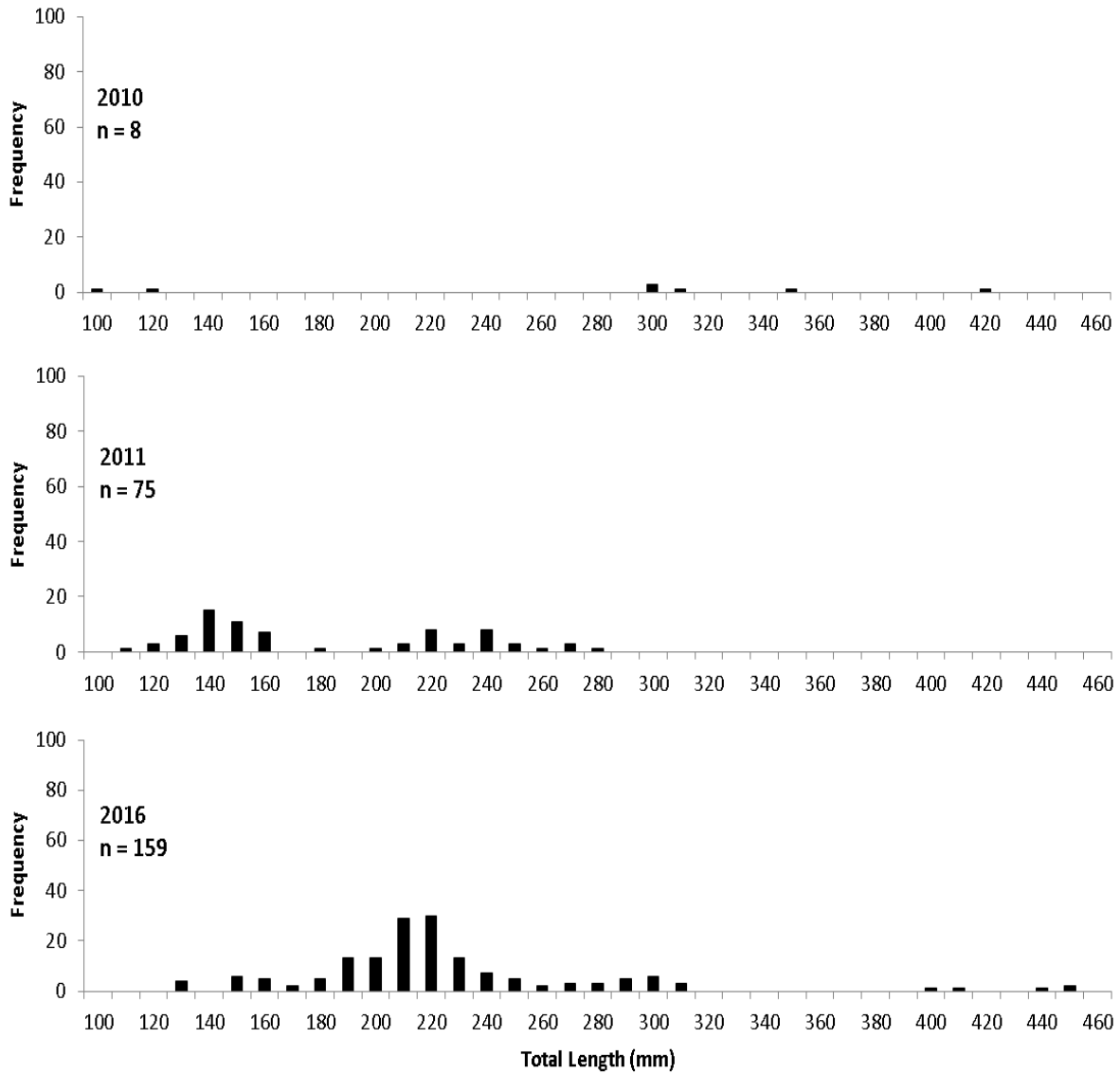


Figure 6. Length frequency distributions of Largemouth Bass collected from Treasureton Reservoir, Idaho, in 2010, 2011, and 2016.

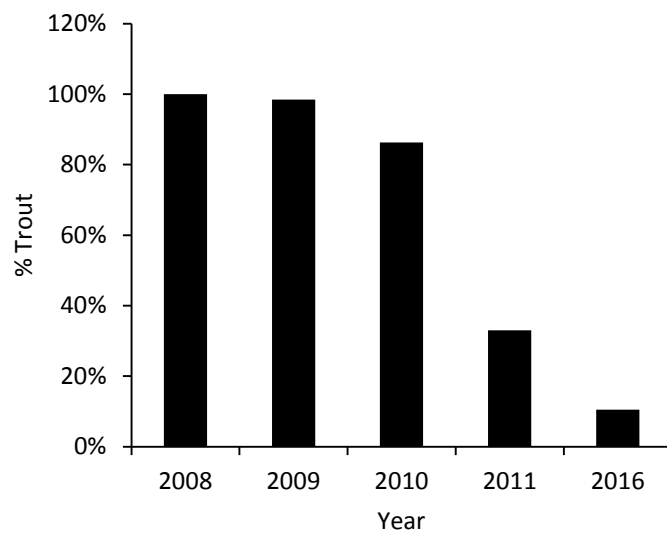


Figure 7. The relative abundance of trout caught in standard electrofishing surveys. Relative trout composition declined from 99% in 2009 to 10% in 2016.

RIVERS AND STREAMS INVESTIGATIONS AND SURVEYS

ABSTRACT

We surveyed the fish community in the Blackfoot River using electrofishing and trapping in 2016. Yellowstone Cutthroat Trout *Oncorhynchus clarkii bouvieri* (YCT) escapement from Blackfoot Reservoir was 204 adults and was still well below the highest observed on the Blackfoot River (4,747). Furthermore, the population of YCT on the Blackfoot River Wildlife Management Area continues to be below historical levels. We also evaluated adult migrant travel time and juvenile to adult return rates (JAR), for Blackfoot River YCT. During all years of the study (2010 – 2016), 75% of the adult migrants reached the spawning grounds in the upper basin in 8 days or less (distance of 51 km). Some individual fish migrated to the spawning grounds in one day. We did not assess travel time in 2011 due to high water during the migration period. Our estimates of juvenile-to-adult returns (JAR) for YCT tagged in 2010 and 2011 were extremely low. In 2010, we tagged a total of 234 YCT < 400 mm total length. Of these, only 7% returned as adults to spawn. Similarly, of the 516 YCT tagged in 2011, only 14% returned as adults to spawn. We think the reason for these low JARs is due to American White Pelican *Pelecanus erythrorhynchos* predation on juvenile YCT. We also sampled Bonneville Cutthroat Trout *Oncorhynchus clarkii utah* (BCT) from eight streams within the Nounan and Pegram Management Units. Bonneville Cutthroat Trout density trends in most streams have continued to decline. We sampled the Snake River below American Falls Reservoir in September 2016 to monitor Smallmouth Bass *Micropterus dolomieu* (SMB). Proportional Stock Densities have continued to increase from a low of 21 in 2005 to a high of 53 in 2016. The length frequency distribution of SMB collected showed there were several strong year classes of young fish present at the time of the survey. Strong cohorts of juvenile fish in the population coupled with a high PSD should provide excellent angling opportunities over the next several years.

Yellowstone Cutthroat Trout Monitoring in the Blackfoot River System

Introduction and Methods

There are two long-term monitoring programs in place for Yellowstone Cutthroat Trout *Oncorhynchus clarkii bouvieri* (YCT) in the upper Blackfoot River. They are adfluvial escapement estimates and river density estimates. Adfluvial escapement estimates are derived from fish captured at an electric weir trap located in the lower river near its confluence with Blackfoot Reservoir. The density estimates are derived from fish captured within a portion of the Blackfoot River Wildlife Management Area (BRWMA) located about 51 km above the reservoir. The adfluvial escapement estimates have been completed every year since 2001. The river density surveys are completed less frequently.

An electric fish migration barrier was installed in the Blackfoot River in 2003 to collect migrating adult adfluvial YCT. The barrier includes a trap box designed using Smith Root Inc. specification. The barrier components include four flush mounted electrodes embedded in Insulcrete, four BP-POW pulsators, and a computer control and monitoring system. The computer system can be operated remotely, records electrode outputs, and has an alarm system that triggers during power outages. Detailed descriptions of these components and their function can be obtained at www.smith-root.com.

The electric barrier was operated from 4 May to 7 June 2016. Prior to observing fish at the trap, field crews checked the live box several times a week. Once fish began entering the trap, it was checked at least once a day. Fish species and total lengths (mm) and weights (g) were recorded. Yellowstone Cutthroat Trout were visually checked for bird scars. Bird scar monitoring began in 2004. Scar rates were associated with increases in pelicans feeding in the Blackfoot River downriver of the trap. All YCT handled at the trap were injected with a 23 mm Half Duplex Passive Integrated Transponder (PIT) tag purchased from Oregon RFID (oregonrfid.com). These fish were tagged so they could be included in a pelican predation study.

In 1994, the Idaho Department of Fish and Game (IDFG), with assistance from the Conservation Fund, purchased the 700-ha ranch and began managing the property as the BRWMA. The BRWMA straddles the upper Blackfoot River, with an upper boundary at the confluence of Lanes, Diamond, and Spring creeks and a lower boundary at the head of a canyon commonly known as the upper narrows. Approximately 9 km of river meander through the property along with 1.6 km of Angus Creek, which is an historical YCT spawning and rearing stream. Since purchasing the BRWMA, IDFG has completed periodic population estimates to monitor native YCT abundance.

We estimated YCT abundance within 5.2 km of the BRWMA reach of the Blackfoot River in 2016. The estimate was completed using mark-recapture methods. Fish were sampled with drift boat-mounted electrofishing gear employing standard pulsed DC waveforms. All YCT captured were injected (marked) with a 23 mm PIT tag (oregonrfid.com), measured for total length (mm) and weighed to the nearest gram and released. Fish were marked on 27 June and recaptured 30 June 2016. Data were analyzed using Fish Analysis + software package (Montana Fish Wildlife and Parks 2004).

Similar to previous years, non-lethal hazing and lethal take of American White Pelicans *Pelecanus erythrorhynchos* (AWP) was utilized again in 2016 in an attempt to reduce predation impacts on migrating YCT. From May to July, hazers patrolled the river from the confluence with

the reservoir to the adfluvial escapement trap and from the lower boundary of the BRWMA to the confluence of Lanes and Diamond Creeks on foot or via ATV (Figure 8). When groups of pelicans were observed on the river, hazers launched explosive pyrotechnics towards the group of birds to scare them off the river. Hazing crews also enumerated the birds encountered each day. In addition to non-lethal hazing, lethal take was also used to discourage pelican use of the river. Lethal take occurred in concert with non-lethal hazing.

Results and Discussion

In 2016, a total of 204 adfluvial YCT were collected at the migration trap. Of these, 172 were females and 23 were males. Captured females and males had a mean length of 503 mm and 501 mm, respectively. The bird scarring rate observed in 2016 was 10%. Scarring rates have varied from no visible scars on fish collected in 2002 to a high of 70% scarred in 2004. Scarring rates may be related to the predation rate by pelicans, but no information is available to determine the relationship. Variation in scarring rates is likely impacted by the overall number of pelicans feeding on the river below the migration trap, water levels and clarity, and hazing efforts exerted on the birds to reduce predation impacts. Adfluvial YCT escapement and bird scar trends are shown in Table 3.

A total of 496 YCT were sampled on the BRWMA during the mark and recapture electrofishing surveys (Table 4). The number of YCT captured in 2016 was in the range of what has been captured in the past (Table 4). In past surveys of the BRWMA reach, juveniles (< 300 mm) dominated catch. Thurow (1981) reported that about 80% of the fish caught during population surveys were less than 300 mm total length. Results from 2013 through 2016 show similar ratios of juvenile cohorts (Figure 9).

Hazing and lethal take began on 7 May 2016 and continued through 30 June 2016. Birds were hazed 1-2 times daily from the adfluvial YCT trap downstream to the river's confluence with the reservoir (about 2.0 km). Efforts to haze birds on the upper River on or near the BRWMA occurred concurrently with activities on the lower river (the BRWMA is about 38 km above the reservoir; Figure 8).

Overall, 1,973 AWP were observed during hazing activities. Of these, 1,560 occurred from the mouth of the river to the adfluvial YCT trap, 43 on the BRWMA and 370 near the river/reservoir confluence. During the same period, we expended a total of 533 non-lethal pyrotechnic projectiles and 114 shotgun shells. Overall, 73 AWP were lethally taken during the hazing period (Figure 10).

Hazing activities combined with lethal take appears to be effective in reducing AWP use of the Blackfoot River. In general, it appears that when lethal take exceeds two birds per day AWP use of the river declines. Conversely, when only hazing occurs, AWP use of the river increases (Figures 11 - 13; Brimmer et al. 2015).

In summary, we conclude that AWP use of the river can be reduced by intensive hazing efforts coupled with the consistent lethal take of birds. It appears that lethal take must exceed two birds per day to achieve the desired outcome.

Yellowstone Cutthroat Trout Life History Investigations on the Upper Blackfoot River and Blackfoot Reservoir

Introduction and Methods

Blackfoot River and Reservoir are located in Caribou County, North of Soda Springs, Idaho. The river begins at the confluence of Lanes and Diamond Creeks at the upper end of the basin and ultimately joins with the Snake River near the city of Blackfoot, Idaho. However, for the purposes of this report, our discussion will focus on the reservoir and the river above (Figure 14).

During the 1980's extensive Yellowstone Cutthroat Trout *Oncorhynchus clarkii bouvieri* (YCT) studies were conducted on the upper Blackfoot River and Blackfoot Reservoir (La Bolle and Schill 1988; Thurow 1981). These studies examined various YCT life history metrics such as reservoir survival, length at age, migration timing, and adult escapement. Various habitat variables were also examined. More recently, a bird predation study was completed where the specific objective was to directly measure American White Pelican *Pelecanus erythrorhynchos*; (AWP) predation rates on adfluvial YCT in the upper Blackfoot River Drainage (Teuscher et al. 2015). Fortunately, the infrastructure used in their study is still in place and functional which allowed us to expand on their work. Specifically, we used fish tagged in their study as well as fish we tagged to estimate juvenile to adult return rates (JAR) and to estimate adult YCT travel time to the spawning areas.

Yellowstone Cutthroat Trout were collected at two locations during our study (2010-2016). We collected migrating adult YCT at an adult migrant electric weir trap located on the lower river near its confluence with the reservoir (Figure 14). Both adult and juvenile YCT were also collected on the Blackfoot River Wildlife Management Area (BFRWMA; see Brimmer et al. 2015 for details). The adult migrant electric weir trap (trap) consisted of a trap box and electric weir designed to Smith Root Inc. specifications. The barrier (weir) components of the trap include four flush mounted electrodes embedded in Insulcrete that spans the width of the river and four BP-POW pulsators that energize the weir. Detailed descriptions of these components and their function can be obtained at www.smith-root.com.

The trap was operated from late April to mid-June annually from 2010 through 2016 with one exception. During 2011, river discharge was too high to operate the trap during the migration run so no adult YCT were tagged there. We checked the live box several times a week until YCT were observed in the trap box. Once fish arrived at the trap, we began checking it at least once a day. When YCT numbers were high (>20), the trap was checked and cleared several times per day. We recorded sex, total length (mm), and weight (g) for all YCT caught at the trap. In addition, YCT handled at the trap were also injected with a 23 mm Half Duplex Passive Integrated Transponder (PIT) tag purchased from Oregon RFID (oregonrfid.com). All YCT handled at the trap were anesthetized before data collection began and then allowed to recover before being released back to the river.

Yellowstone Cutthroat Trout sampled from the BFRWMA were collected with drift boat mounted electrofishing gear using standard pulsed DC waveforms. All YCT captured were anesthetized, injected with a 23mm PIT tag (oregonrfid.com), measured for total length (mm) and weighed to the nearest gram and released. Fish were collected from 2010-2016 during the months of May, June, July, and August.

Tagged YCT were subsequently recovered at three locations during the study. Two passive PIT tag arrays were deployed in the river, one about 1km below the trap and the other on the BFRWMA (Figure 14). See Brimmer et al. 2010 for complete PIT tag array details. The PIT tag arrays were operated annually from late April through October. The last tag recovery location was at the trap. All YCT captured at the trap were also scanned for tags.

To estimate travel time, we used adult YCT tagged at the trap each year. These fish were tagged, released, and allowed to continue their spawning migration run to the upper basin. If they arrived at the BFRWMA, they were detected on the upper PIT tag array and were included in the analysis (Figure 14). These results are reported in days by year.

We assessed cumulative bird predation by using YCT tagged at the BFRWMA (WMA) that were less than 400 mm TL. Since fish captured and tagged at the WMA were a mixture of year classes, we grouped them by year instead of by cohort. Each fish tagged was tracked over time (by the PIT tag arrays) and the final disposition of each fish was determined. Since the life cycle of YCT can be 6-8 years or more, we only include data for 2010 and 2011 here. We categorized each tagged fish into one of three categories: Unknown, Bird Predation and JAR. Fish assigned to the Unknown category were YCT that were tagged and detected once but never detected again. These YCT could have been preyed upon and the tags were never recovered, they could have succumbed to natural mortality, their tags may have failed, or they could still be at large. Fish assigned to the Bird Predation category were YCT that were recovered from the AWP nesting colony on Blackfoot Reservoir (Figure 14). See Teuscher et al. 2015 for complete details. Finally, YCT tagged at the WMA and subsequently detected as adults during their return spawning run were assigned to the JAR category. Juvenile to Adult Returns were estimated by dividing the number of returning adults by the total number of YCT tagged by year. For example, if 10 adult YCT returned out of 100 fish tagged in 2010, then the JAR for 2010 would be 10%.

Results and Discussion

Adult YCT travel times were similar between years. In all years the majority of fish (75%) arrived at the WMA in 8 days or less (Figure 15). In two instances (2013 and 2015) a few fish made the journey to the WMA in one day (Figure 15). Adult YCT travel time does not appear to be correlated to May average river discharge ($r^2 = 0.15$; $P = 0.44$). However, we speculate that travel time may be influenced by the spawning readiness of the fish in any given year or by water temperature during the spawning migration.

Teuscher et al. (2015) showed that predation by AWP on juvenile YCT can be relatively high. For example, they reported that juvenile YCT tagged at the WMA in 2010 experienced a total predation rate of nearly 71%. However, this estimate was limited to only total predation that occurred on that group of fish tagged in 2010 but did not take into account the predation that occurred on those YCT in subsequent years. Our study builds on their work insofar as we track predation and other losses over time and report Juvenile to Adult Return rates for YCT tagged in 2010 and 2011.

As mentioned above, YCT tagged at the WMA in 2010 and 2011 contained a mixture of cohorts. To minimize confusion, we report our findings based on tag year, not fish age. In 2010, we tagged a total of 234 YCT < 400 mm TL. Of these, 57% had Unknown dispositions. Thirty-six percent of these tags were recovered from the AWP nesting colony on Blackfoot Reservoir.

These recoveries were the result of AWP predation and were assigned to the Bird Predation category. Finally, only 7% of the YCT tagged in 2010 returned to spawn (JAR; Figure 16).

We were able to determine the final disposition of a higher proportion of fish in 2011 than in 2010. We tagged a total of 516 YCT in 2011. Of these, just 31% had an Unknown disposition. A total of 55% of the YCT tagged in 2011 were eventually recovered from the AWP nesting colony. This was nearly twice as high as what was observed for fish tagged in 2010. Juvenile to Adult Return rates (14%) for fish tagged in 2011 were also higher than observed in 2010 (Figure 16).

As mentioned above, we only have complete returns for fish tagged in 2010 and 2011. However, we have had sufficient returns of fish tagged in subsequent years to assess future adult escapement. For example, of the YCT tagged in 2013, at least 80% have already been lost to AWP predation. Therefore, it is likely there are few YCT left to return. Similarly, a high percentage (73%) of fish tagged in 2014 were also lost to bird predation. The bulk of the fish tagged in these two years should have returned to spawn in 2015 and 2016. Unfortunately, few have and we do not expect more in the future since 6 and 7 year old fish comprise a very small percentage of the total run each year (Table 5). Based on the above data and the number of YCT already lost to AWP predation in 2015 and 2016, we do not expect a large run of adult YCT in 2017.

In summary, AWP predation on YCT in the upper Blackfoot River remains high. The low JARs reported here suggest that unless AWP predation is substantially reduced in the near future, it is unlikely the YCT population in the upper Blackfoot River will recover to historical levels.

Bonneville Cutthroat Trout Monitoring Program

Introduction and Methods

Bonneville Cutthroat Trout *Oncorhynchus clarkii utah* (BCT) are one of three native cutthroat trout sub-species in Idaho. The distribution of BCT is limited to the Bear River Drainage in Southeastern Idaho. In the early 1980s, distribution and abundance data for this native trout were deficient. Initially, to better understand BCT population trends and the potential influence of natural and anthropogenic processes, a long-term monitoring program was initiated for three tributary streams of the Thomas Fork Bear River (Preuss, Giraffe, and Dry Creeks). These streams were to be sampled every other year. In 2006, as part of the BCT management plan (Teuscher and Capurso 2007), additional streams were added to the BCT monitoring program to implement a broader representation of BCT population trends from across their historical range in Idaho. These additional monitoring streams included Eightmile, Bailey, Georgetown, Beaver, Whiskey, Montpelier, Maple, Cottonwood, Snow slide, First, Second, and Third creeks, and the Cub River. In 2010, IDFG personnel determined that the monitoring program would be better represented by dropping some sites and streams initiated in 2006, while adding other streams throughout the four BCT management units in the Bear River drainage (Figure 17). Currently, the monitoring program consists of three streams and eight sites in the Pegram Management Unit (PMU), six streams and 14 sites in the Nounan Management Unit (NMU), four streams and nine sites in the Thatcher Management Unit (TMU), four streams and eight sites in the Riverdale Management Unit (RMU), and three streams and six sites in the Malad Management Unit (MMU; Table 6). We will sample half of these streams annually. In addition, the monitoring program includes two segments of the main-stem Bear

River in each of the management units. Main-stem Bear River segments in each management unit will be sampled every four years.

There are a number of variables that may influence BCT population trends which include annual precipitation, water temperature, irrigation, grazing, etc. (Teuscher and Capurso 2007). We collected a suite of habitat variables that may impact BCT abundance and distribution. The descriptions of these habitat variables and collection methods are listed in Table 7. In the future, habitat data will be correlated to variation in BCT abundance. Because analysis of habitat variables require many years of data collection, no statistical analysis will be reported until sufficient data is collected.

To calculate mean BCT densities, we sampled at least two sites on each stream using multiple pass removal techniques with backpack electro-fishing equipment. At each site, a segment of stream (approximately 100 m) was sampled, which included block nets at the downstream and upstream boundaries. The area (m^2) sampled was calculated using length (m) and average width (m). We calculated a population estimate using Microfish 3.0 software (Microfish Software, Durham, NC, USA). BCT percent composition was calculated by dividing the number of BCT by the total number of all salmonids sampled. Mean densities and percent composition for an entire stream was calculated by averaging the mean values from each site within a stream. Relative weights (W_i) were calculated for individual fish using the standard weight equation developed for cutthroat trout (Kruse and Hubert 1997). Mean relative weight for each stream was calculated by averaging individual relative weights pooled across all sites.

Results and Discussion

In 2016, eight streams were sampled which included 11 sites within the NMU and six sites in the PMU (Figure 17). The sites that we did not sample were due to either lack of landowner permission or the streams were dry. Overall, mean BCT density was 3.4 BCT/100 m^2 (± 1.5 , SE; range 0.0 – 15.4). The highest BCT density was observed in Giraffe Creek (15.4 BCT/100 m^2) and the lowest was in Bailey and Georgetown Creeks (0.0 BCT/100 m^2). The percent composition of BCT in relationship to other salmonids sampled was variable between streams. The percent composition of BCT was lowest in Bailey and Georgetown Creeks (0%) and the highest was observed in Dry, Giraffe, Preuss and Stauffer Creeks at 100% (Table 8; Table 9). Figures 18 and 19 show population trends.

In the PMU, BCT densities have declined in Preuss, Giraffe and Dry Creeks over the past few years (Figure 18). In 2012, we identified that annual precipitation from the prior year was positively correlated to BCT densities in Dry Creek (Brimmer et al., 2013). During the 2016 water year, these drainages received above average annual precipitation. Therefore, we expect to observe increases in the near future.

Bonneville Cutthroat Trout density trends varied by stream in the NMU (Figure 19). In Bailey and Georgetown Creeks we did not sample any BCT. In Eightmile and Montpelier creeks, there was a slight increase in BCT densities and in Stauffer Creek there was a slight decrease in BCT densities when compared to 2014. For Pearl Creek, we did not have landowner permission to sample, so no data was collected.

Snake River

Introduction and Methods

In the late 1980s, Smallmouth Bass *Micropterus dolomieu* (SMB) were introduced into the upper Snake River System. Stocking locations included Gem Lake, Lake Walcott, and American Falls Reservoir. The initial stocking events resulted in natural reproducing populations, which expanded rapidly during the 1990s. The success of the SMB population enhanced fishing opportunities in the Snake River system.

Anglers quickly responded to the new SMB fishery. In American Falls Reservoir, SMB increased from 0% of total catch in 1993 to 28% in 2000. The same trend was observed in the Snake River below American Falls Dam. Smallmouth Bass started contributing to river creels in the late 1990s and currently make up a significant component of effort and total catch.

The U.S. Fish and Wildlife Service manages a wildlife refuge that includes 40 km of the Snake River between American Falls and Minidoka dams. The primary function of the refuge is to preserve breeding grounds for water birds. To facilitate that goal, about 60% of the refuge is closed to boating. Since the primary method of fishing for SMB is by boat and shore access is extremely limited, the closed boating sections are largely unexploited by anglers.

Angler opinions regarding future management of the fishery vary. Local bass club members prefer restrictive harvest regulations. Other users support the general regulation to harvest six SMB over 305 mm (12 inches). In 2003, results of a random survey of 1,000 anglers showed more support for general bass regulations (41%) compared to those that favored a change to more restrictive harvest (28%). In addition to interest in harvest regulations, anglers are requesting more fishing access for sections of the Snake River that are currently closed to boats.

In 2004, the Idaho Department Fish and Game began investigating the SMB fishery in the Snake River from the tailrace of American Falls Dam downriver to Minidoka Dam. The primary goals of the work were to estimate angler exploitation and determine how the closed boating zones affect angling impacts on SMB populations. The boating closure provided a unique opportunity to compare SMB populations from open (exploited) and closed (unexploited) areas (Figure 21). Specific questions included: 1) are SMB mortality rates different between open and closed boating zones, 2) has the quality of smallmouth bass being caught in the open boating zones declined with increases in angling pressure. The results of this research indicated that the exploitation rate of SMB in areas accessible to anglers was nearly 50%. These results clearly showed that under the then current general bass regulations, the quality of this fishery could not be maintained. In response to these findings, the Department implemented a 2 bass any size regulation on the reach of the Snake River that runs from American Falls Dam to the closed boating zone below Gifford Springs. This regulation change took effect in 2008. The purpose of our current work was to assess the status of the SMB fishery in the zone open to boating (Figure 20).

Smallmouth Bass were collected using night-time shoreline electrofishing. The area sampled was between Gifford Springs and the upper end of Massacre Rocks State Park (areas open to boating; Figure 20). Samples were collected with boat-mounted electrofishing equipment. All electrofishing effort was completed between 2100 and 0400 hours. Total length (mm) and weight (g) was recorded for each fish. We pooled the catch data (as was done in

2005 and 2012) then used SMB length and weight, Catch Per Unit Effort (CPUE), Proportional Stock Density (PSD), and Relative Weight (W_r) information in our analysis.

Results and Discussion

We sampled SMB from the open boating zones (open zone) of Massacre Rocks and Gifford Springs on 15 September and 19 September 2016. We captured a total of 253 SMB ranging in size from 64 mm to 526 mm. The mean length and weight of these fish were 178 mm and 172 g, respectively (Table 10). The length frequency distribution of SMB collected in 2016 showed excellent production of juvenile fish which was similar to 2005 (Figure 21). Proportional Stock Density continued to increase. During 2005, the observed PSD was 21; well below the desirable range of 40-60 (Anderson and Neumann 1996). However, the PSDs of 49 and 53 observed in 2012 and 2016, respectively, were much higher and were well within the desirable PSD range (Table 10). Relative Weights of SMB collected from the open zone remained unchanged. Smallmouth bass collected during 2005, 2012, and 2016 had a mean W_r of 114, 114, and 116, respectively. These data indicate the fish in our samples were in excellent condition.

In summary, the SMB fishery in the open zone of the Snake River appears to be performing well. A high PSD coupled with several strong cohorts of young fish should provide excellent angling opportunities over the next several years.

MANAGEMENT RECOMMENDATIONS

1. Continue evaluation of Yellowstone Cutthroat Trout life history metrics
2. Continue pelican predation work on the Blackfoot River system
3. Continue Bonneville Cutthroat Trout monitoring

Table 3. Yellowstone Cutthroat Trout escapement estimates for the Blackfoot River above Blackfoot Reservoir from 2001-2016. No escapement estimates are available in 2011 due to extremely high river discharge during the migration season, which resulted in poor tapping efficiency.

Year	Weir type	YCT count	Mean length(mm)	% Bird scars	Mean May discharge (cfs)	Adult pelican count
2001	Floating	4747	486	No data	74	No data
2002	Floating	902	494	0	132	1352
2003	Electric	427	495	No data	151	1674
2004	Electric	125	478	70	127	1748
2005	Electric	16	Na	6	388	2800
2006	Electric	19	Na	38	453	2548
2007	Electric	98	445	15	115	3416
2008	Electric	548	485	10	409	2390
2009	Electric	865	484	14	568	3174
2010	Electric	938	468	12	248	1734
2011	Electric	Na	Na	Na	936	724
2012	Electric	530	483	37	200	3034
2013	Electric	1843	486	34	176	1996
2014	Electric	807	487	24	302	2096
2015	Electric	190	496	7	278	1466
2016	Electric	204	495	10	317	974

Table 4. Yellowstone Cutthroat Trout (YCT) population and density estimates collected from the Blackfoot River Wildlife Management Area of the Blackfoot River, Idaho.

Year	Fish marked	Fish captured	Fish recaptured	% Recaptured	Pop. estimate	Pop. est SD	Density
2005	266	202	20	7.5	3,664	569.1	421
2006	339	450	57	16.8	3,534	352.3	406
2008	223	186	28	12.6	2,504	336.5	288
2009	279	319	44	15.8	2,567	286.5	494
2010	317	272	11	3.5	12,944	4,131.2	2,489
2011	318	147	16	5	3,222	411.3	620
2012	137	99	12	12.1	1,672	421.7	322
2013	65	N/A	N/A	N/A	N/A	N/A	N/A
2014 ^b	137	130	12	9.2	2,147	417.9	413
2015	149	119	14	11.8	3,659	593.9	704
2016	210	309	23	7.4	2,717	386.3	522
Mean ^a	229	218	25	11	2,854	419.5	466

^bExcludes adfluvial fish > 400mm

^aExcludes 2010 and 2013.

Table 5. Dispositions of Yellowstone Cutthroat Trout Passive Integrated Transponder tagged on the upper Blackfoot River, Idaho, from 2012 – 2016.

Category	2012	2013	2014	2015	2016
Total Tagged	399	224	251	214	271
Unknown (%)	63	19	22	57	77
Bird Predation (%)	34	80	73	40	23
Juvenile to Adult Returns (%)	3	1	5	3	0

Table 6. The 20 monitoring streams and number of sites within the five BCT management units, including the length (km) of stream sampled, total stream length (km), and the percent of stream sampled.

Management Unit	Stream	Sites	Stream Sampled (km)	Stream Length (km)	% Sampled
Pegram	Dry Ck.	2	0.2	13.4	1.5
	Giraffe Ck.	2	0.2	5.7	3.5
	Preuss Ck.	4	0.4	22.0	1.8
	Bear River	2	17.2	61.2	28.1
Nounan	Bailey Ck.	2	0.2	9.9	2.0
	Eightmile Ck.	3	0.3	23.6	1.3
	Georgetown Ck.	3	0.3	21.8	1.4
	Montpelier Ck.	2	0.2	36.0	0.6
	Pearl Ck.	2	0.2	5.3	3.8
	Stauffer Ck.	2	0.2	14.5	1.4
	Bear River	2	18.8	94.5	19.9
Thatcher	Cottonwood Ck.	3	0.3	37.4	0.8
	Hoopes Ck.	2	0.2	13.5	1.5
	Trout Ck.	2	0.2	18.3	1.1
	Whiskey Ck.	2	0.2	5.1	3.9
	Bear River	2	18.0	37.8	47.6
Riverdale	Beaver Ck.	2	0.2	13.7	1.5
	Logan R.	2	0.2	4.7	4.3
	Maple Ck.	3	0.3	16.1	1.9
	Stockton Ck.	2	0.2	9.8	2.0
	Bear River	2	13.6	50.2	27.1
Malad	First Ck.	2	0.2	9.0	2.2
	Second Ck.	2	0.2	8.4	2.4
	Third Ck.	2	0.2	11.2	1.8

Table 7. List of habitat variables, units of measurement and collection methods for habitat characteristics used to explain variation in BCT abundance estimates.

Habitat Variable	Unit of Measurement	Collection Methods
Water Temperature	Celsius	Measured at beginning of survey with handheld thermometer to the nearest ± 0.5 ($^{\circ}\text{C}$).
Conductivity	$\mu\text{s}/\text{cm}$	Measured at beginning of survey with conductivity meter to the nearest ± 0.1 ($\mu\text{s}/\text{cm}$).
Discharge	ft^3/sec	Measured stream discharge with Rickly discharge meter in a uniform stream segment, using methods proposed by Harrelson et al. (1994)
Gradient	Percent	Gradient was calculated using aerial imagery by calculating the difference in water elevation from an upstream location to a downstream location that was greater than 50 meters apart.
Stream Width	Meters	Measure the wetted width (± 0.1 m) of the stream at ten (10) equally spaced transects within the survey reach and then calculate the mean reach width.
Stream Depth	Centimeters	At ten (10) equally spaced transects, measure and sum the depth (± 1 cm) of the stream at $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ distance across the channel and divide by four. Use these values to calculate the mean reach depth.
Width/Depth Ratio	Meters	Convert the mean reach depth into meters. Divide the mean reach width by the mean reach depth.
Percent Banks	Stable Percent	At the ten (10) equally spaced transects, determine and circle if the bank on the left and right are stable using the following definition. Streambank is stable if they DO NOT show indications of alteration such as breakdown, erosion, tension cracking, shearing, or slumping (Burton 1991).
Total Cover	Percent	Followed instructions from the streambank cover form in Bain and Stevenson (1999).
Canopy	Percent	Used a spherical densiometer and followed the methods of Platts et al. (1987).

Table 8. Descriptive values of Bonneville Cutthroat Trout population trends for the Pegram Management Unit.

Management Unit	Stream	Year	Sites	BCT / 100 m ²		% Comp	Avg.W _r
				Mean	(+/-) 1 SE		
Pegram	Dry Ck.	1987	1	13.8	N/A	100	61
		1990		4.3		100	
		1993		0.0		100	
		1998	3	13.8	0.8	100	
		2000		24.9		100	
		2002		0.6		100	
		2004		0.0		100	
		2006	3	3.1		100	78
		2008	2	0.5	0.2	100	106
		2010	2	2.0	0.1	100	
		2012	2	14.9	0.1	100	82
		2014	1	3.6	N/A	100	91
		2016	2	2.4	1.2	100	83
	Giraffe Ck.	1981		2.2		100	
		1986	1	20.3	N/A	100	61
		1987	2	36.0	4.5	100	78
		1989	1	26.5	N/A	100	
		1990	1	9.8	N/A	100	
		1993	2	0.3	0.3	100	
		1995	3	3.9	0.7	100	
		1998	4	15.7	4.7	100	
		2000		16.9		100	
		2002	1	4.0	N/A	100	
		2004		4.0		100	
		2006	3	4.2		100	
		2008	4	5.0		100	92
		2012	2	25.1	2.9	100	90
		2014	2	15.8	6	100	84
		2016	2	13.0	2.4	100	76
	Preuss Ck.	1981	1	21.5	N/A	100	
		1985	2	24.1	9.7	100	78
		1986	2	15.7	1.1	100	58
		1987	3	10.7	2.8	100	71
		1988		22.0		100	
		1989	2	2.6	2.0	100	
		1990	3	2.8	0.1	100	
		1991	4	3.2	1.2	100	
		1993	5	5.1	2.6	100	90
		1995	6	3.1	0.7	100	
		1997		8.8		100	
		1998		3.2		100	
		2000		7.9		100	
		2002	2	5.0	1.7	100	
		2004	11	9.1		100	
		2006	7	6.0		100	77
		2008	7	4.0		100	87
		2010	2	2.7	0.3	100	87
		2012	2	28.2	15.6	100	82
		2014	3	4.6	2.5	100	88
		2016	2	2.8	0.8	100	78

Table 9. Descriptive values of Bonneville Cutthroat Trout population trends for the Pegram Management Unit.

Management unit	Stream	Year	Sites	BCT / 100 m ²		% Comp	Avg. W _r
				Mean	(+/-) 1 SE		
Nounan	Bailey Ck.	2001	1	0.0	N/A	0	110
		2006	1	0.0	N/A	0	
		2008	1	2.9	2.9	12	
		2010	1	0.0	N/A	0	
		2012	2	0.3	0.3	2	
		2014	2	0.0	N/A	0	
		2016	2	0.0	N/A	0	
	Eightmile Ck.	1993	4	1.0	0.4	3	93
		1994	4	0.7	0.3	6	
		2001	4	0.1	0.1	1	
		2006	1	0.3	N/A	4	
		2007	3	2.4	0.7	25	
		2008	1	2.8	N/A	12	
		2010	3	0.9	0.3	4	
		2012	3	2.2	1.9	5	
		2014	2	0.3	0.3	1.5	
		2016	2	0.9	0.4	18	
	Georgetown Ck.	1994	4	0.0	N/A	0	
		2000	3	0.0	N/A	0	
		2006	3	0.0	N/A	0	
		2007	4	0.0	N/A	0	
		2008	2	0.0	N/A	0	
		2012	3	0.0	N/A	0	
		2014	2	0.0	N/A	0	
	Montpelier Ck.	2000	3	1.1	0.3	32	82
		2006	3	1.6	0.6	20	
		2008	2	1.8	1.1	42	
		2012	2	2.1	1.9	15	
		2014	2	2.4	2.4	21	
		2016	2	4.3	4.3	24	
	Pearl Ck.	2007	1	35.0	N/A	72	76
		2012	2	11.8	8.8	76	106
	Stauffer Ck.	2007	5	7.7	4.7	100	81
		2012	2	22.9	20.0	100	78
		2014	1	5.8	N/A	100	91
		2016	2	3.8	0	100	86

Table 10. Catch Per Unit Effort (CPUE; Hour), Proportional Stock Density (PSD) and other parameters of interest generated from Smallmouth Bass captured from the open boating areas of the Snake River below American Falls, Idaho, in 2005, 2012 and 2016.

Year	CPUE	PSD	Mean Length (mm)	Mean Weight (g)	Sample Size
2005	52	21	197	202	359
2012	95	49	251	384	202
2016	279	53	178	172	253

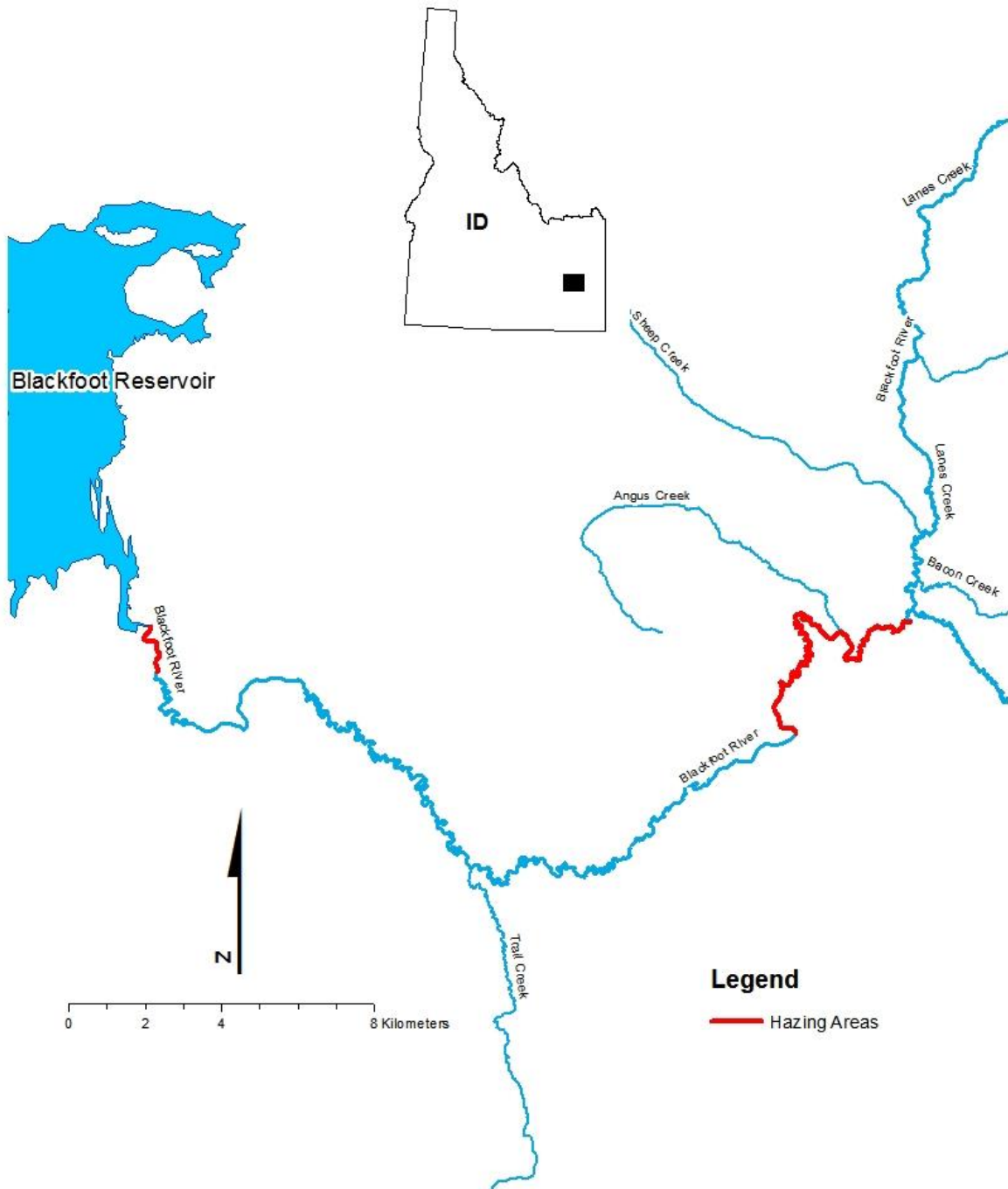


Figure 8. Locations where hazing and lethal take of American White Pelicans occurred on the upper Blackfoot River, Idaho, 2013-2016.

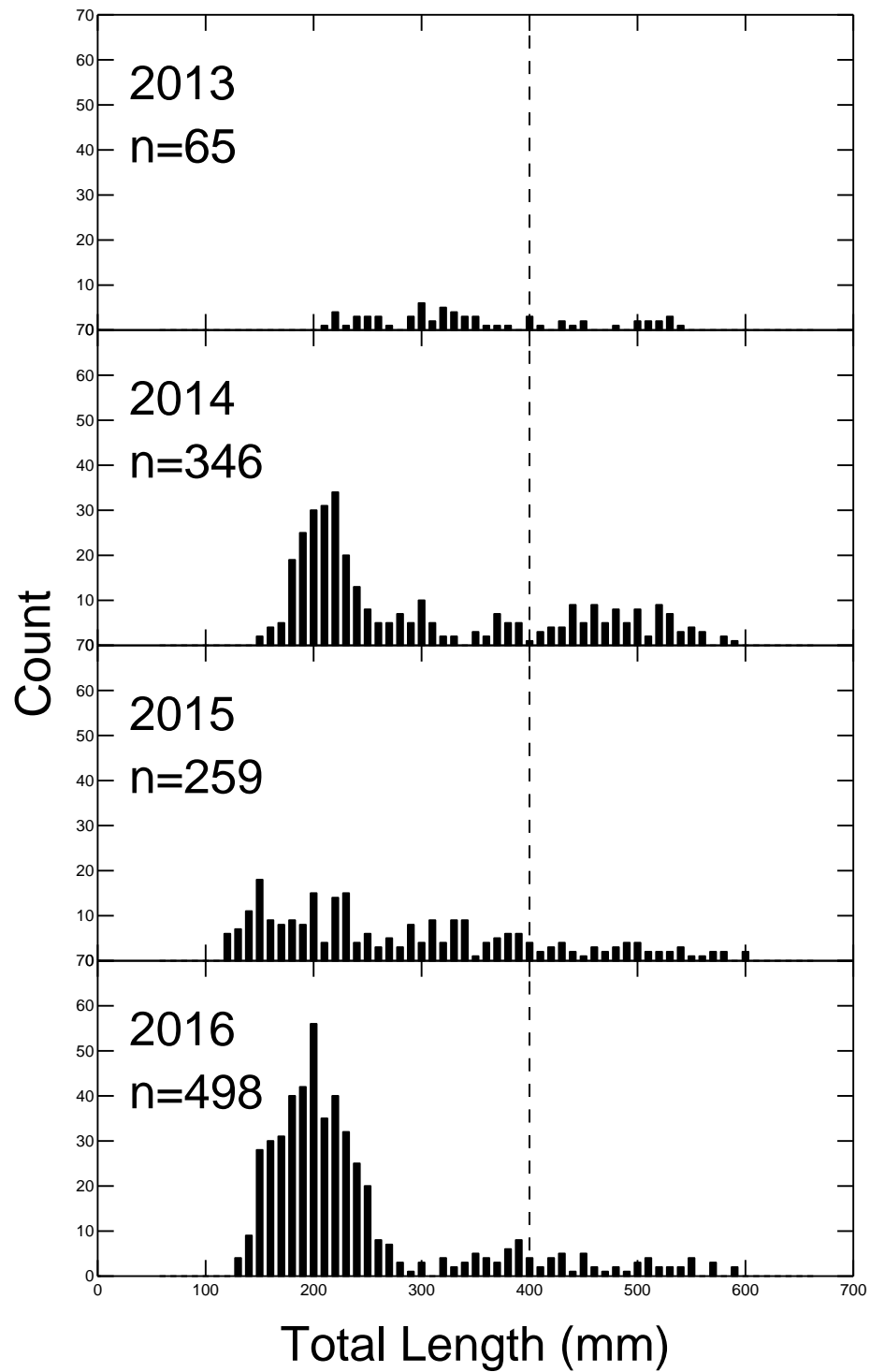


Figure 9. Length frequency distributions of Yellowstone Cutthroat Trout caught from the Blackfoot River Wildlife Management Area of the Blackfoot River, Idaho. The majority of fish located to the right of the vertical dashed lines are likely post spawn adfluvial fish that may return to Blackfoot Reservoir.

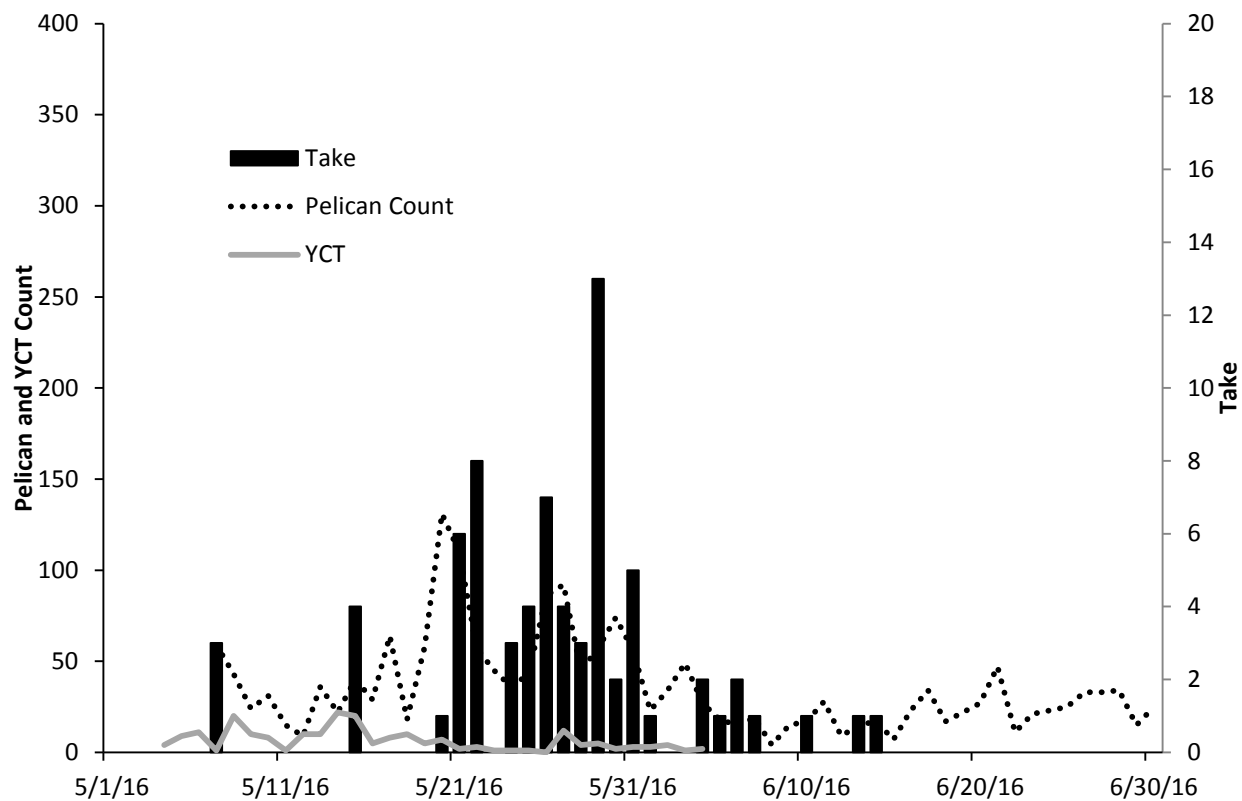


Figure 10. Numbers of Yellowstone Cutthroat Trout (YCT) and American White Pelicans observed on the upper Blackfoot River, Idaho, during 2016. Lethal take of American White Pelicans is also reported.

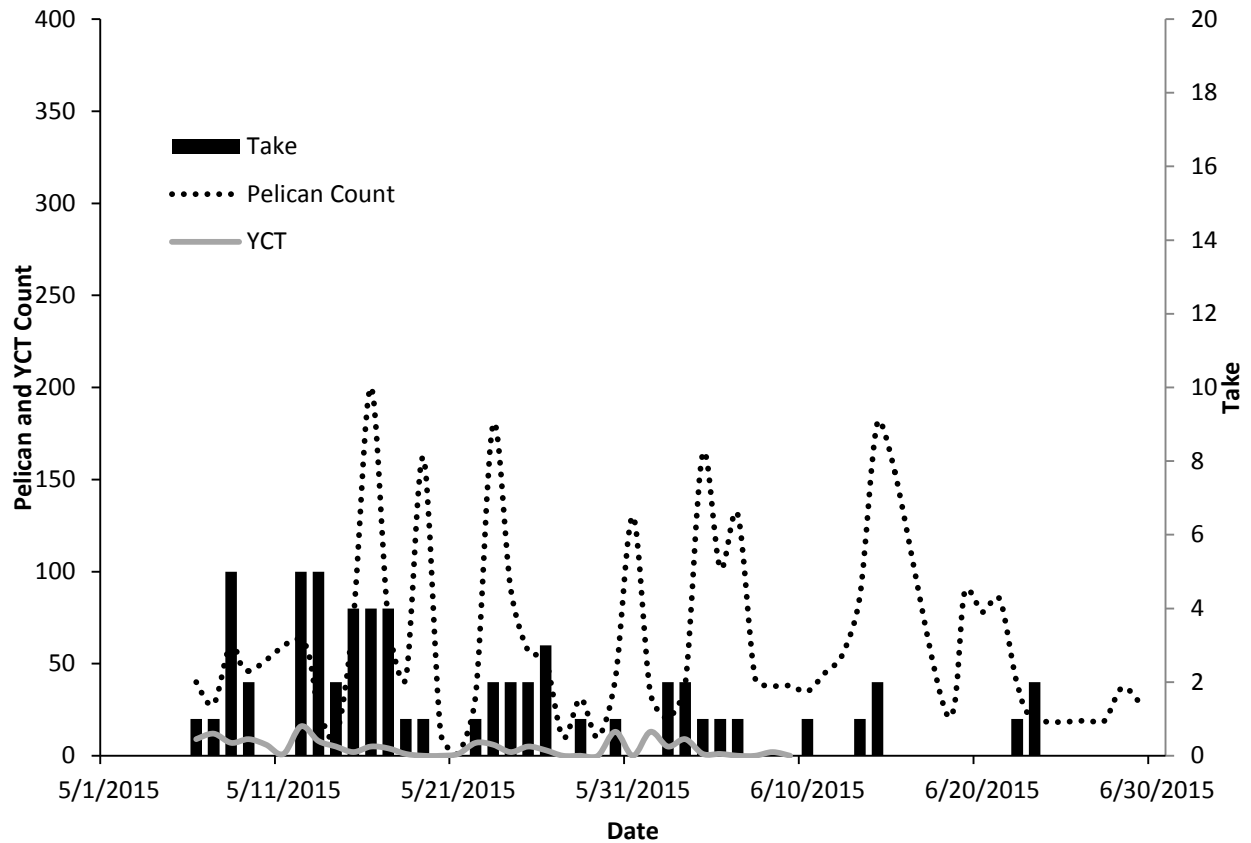


Figure 11. Numbers of Yellowstone Cutthroat Trout (YCT) and American White Pelicans observed on the upper Blackfoot River, Idaho, during 2015. Lethal take of American White Pelicans is also reported.

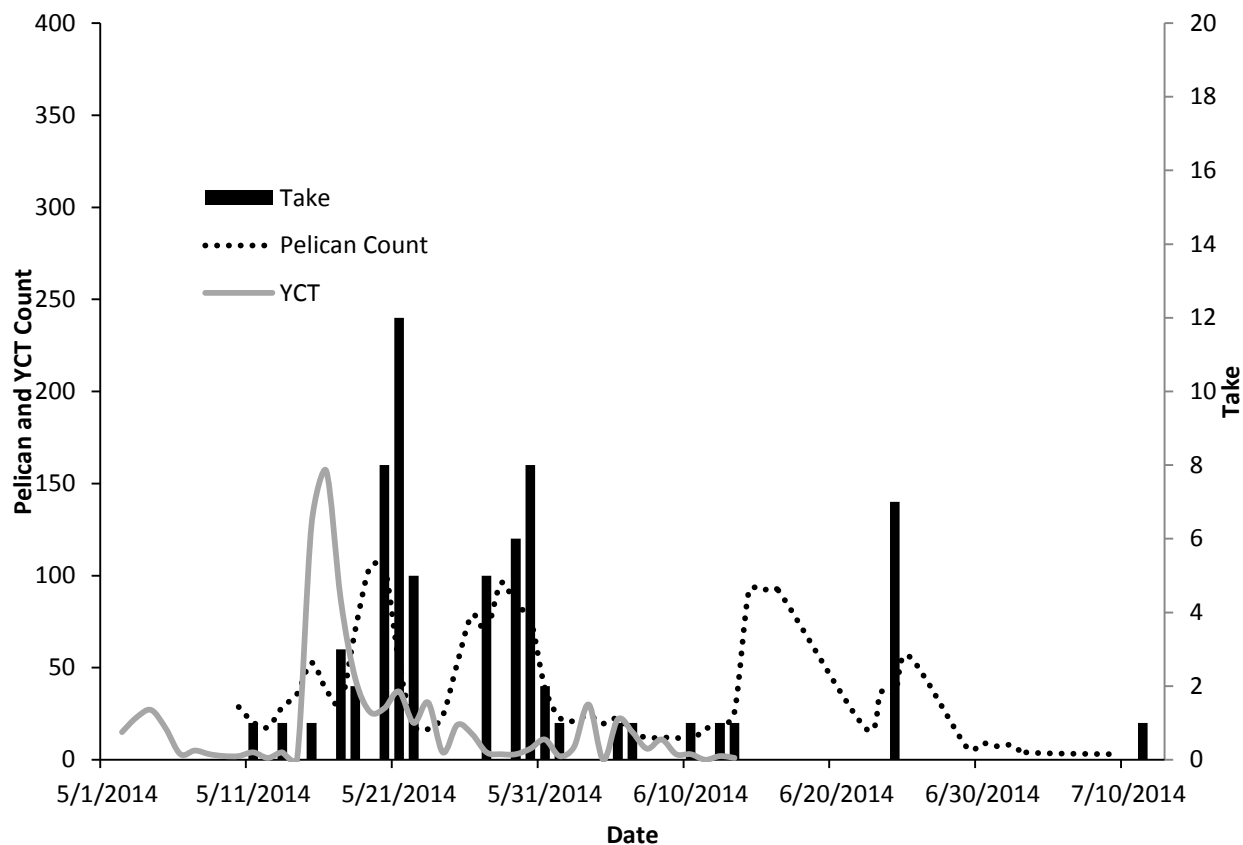


Figure 12. Numbers of Yellowstone Cutthroat Trout (YCT) and American White Pelicans observed on the upper Blackfoot River, Idaho, during 2014. Lethal take of American White Pelicans is also reported.

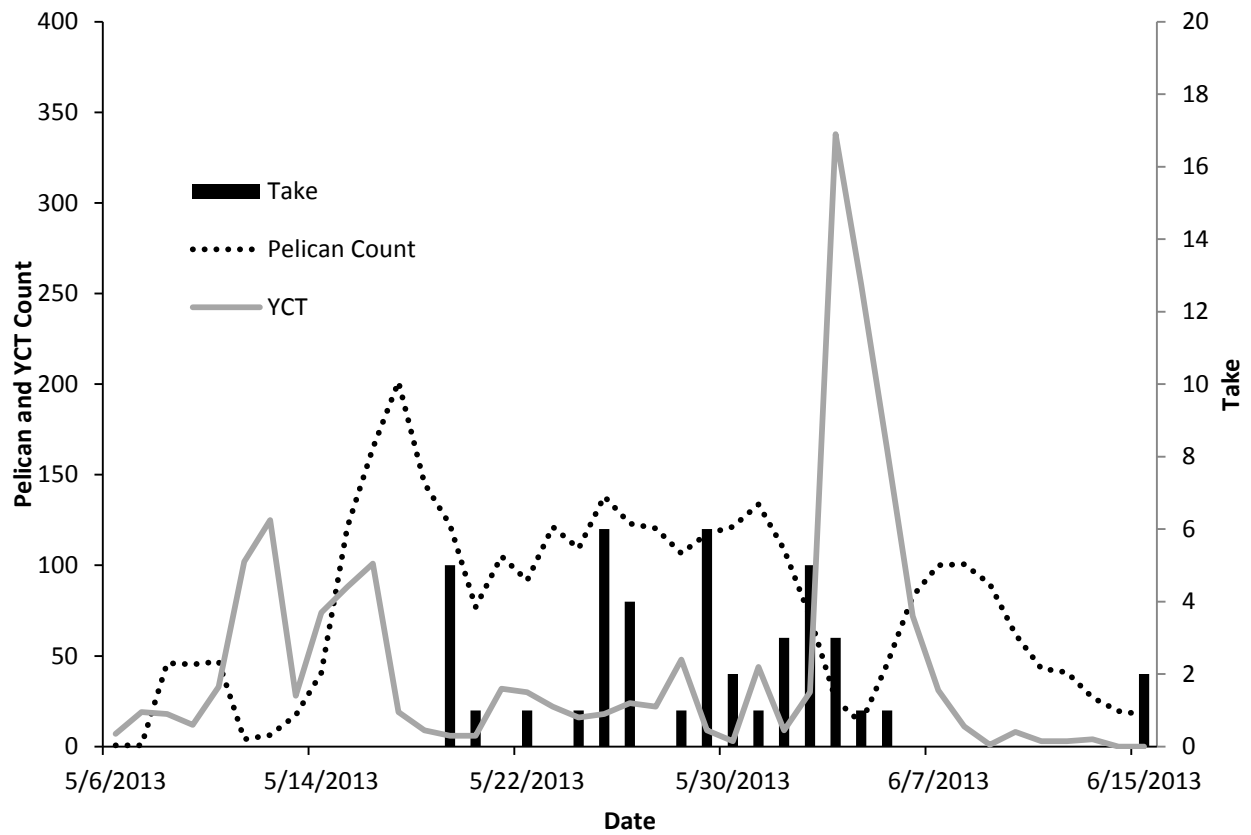


Figure 13. Numbers of Yellowstone Cutthroat Trout (YCT) and American White Pelicans observed on the upper Blackfoot River, Idaho, during 2013. Lethal take of American White Pelicans is also reported.

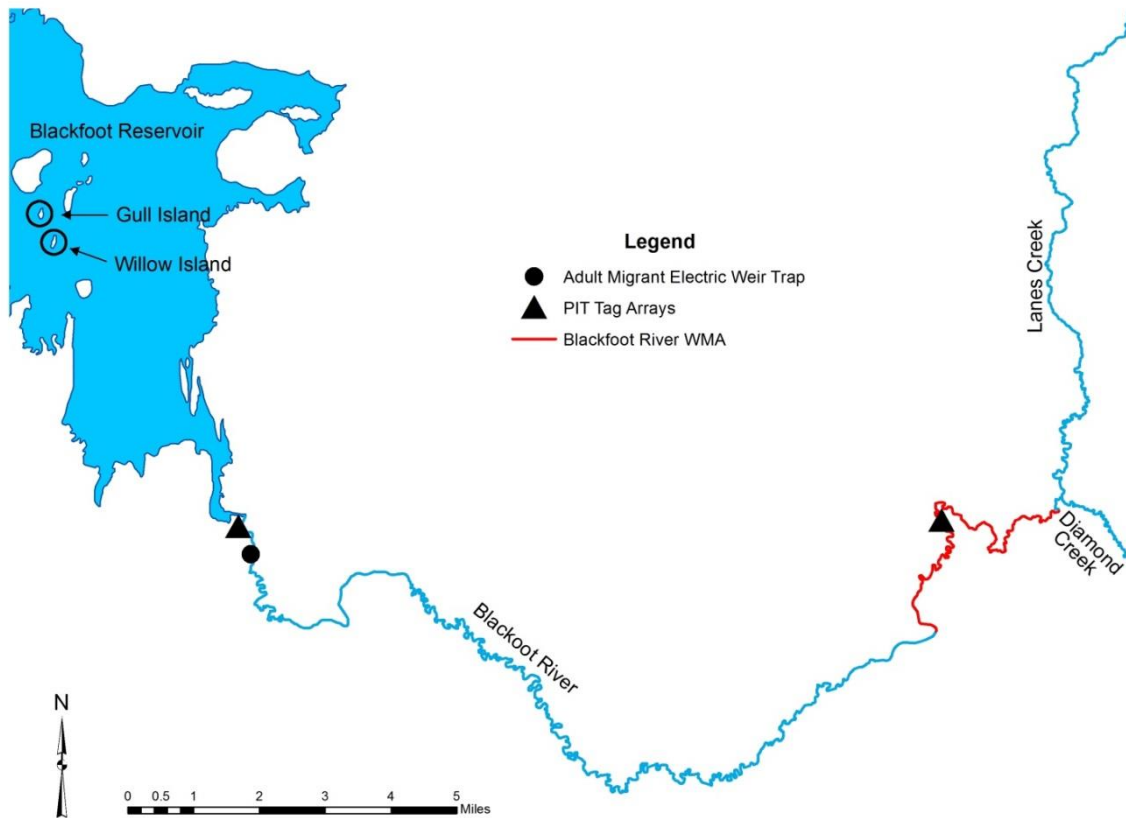


Figure 14. Locations where Yellowstone Cutthroat Trout were PIT tagged (Adult migrant electric weir trap; Blackfoot River WMA) and subsequently detected (Adult migrant electric weir trap; PIT tag Arrays) on the upper Blackfoot River, Idaho from 2010 – 2016. Tagged fish consumed by American White Pelicans were detected and recovered from Gull and Willow Islands.

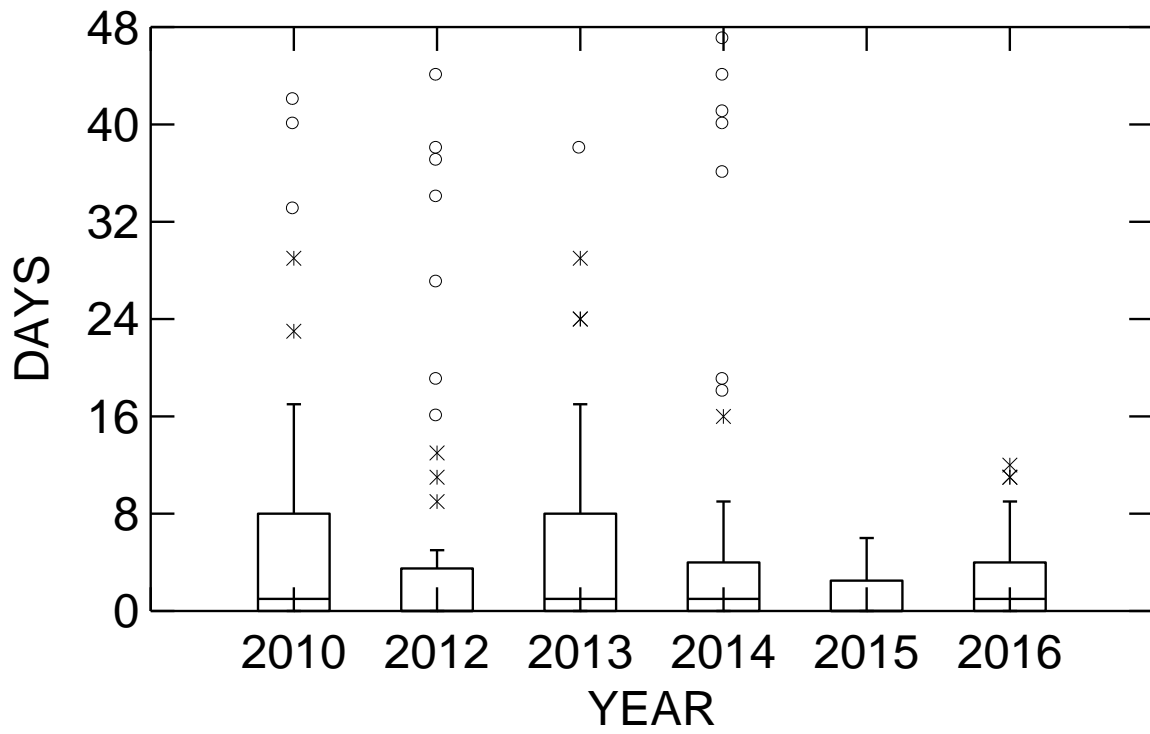


Figure 15. Travel times of adult adfluvial Yellowstone Cutthroat Trout collected from the upper Blackfoot River, Idaho, from 2010 – 2016. No fish were collected in 2011 due to high water.

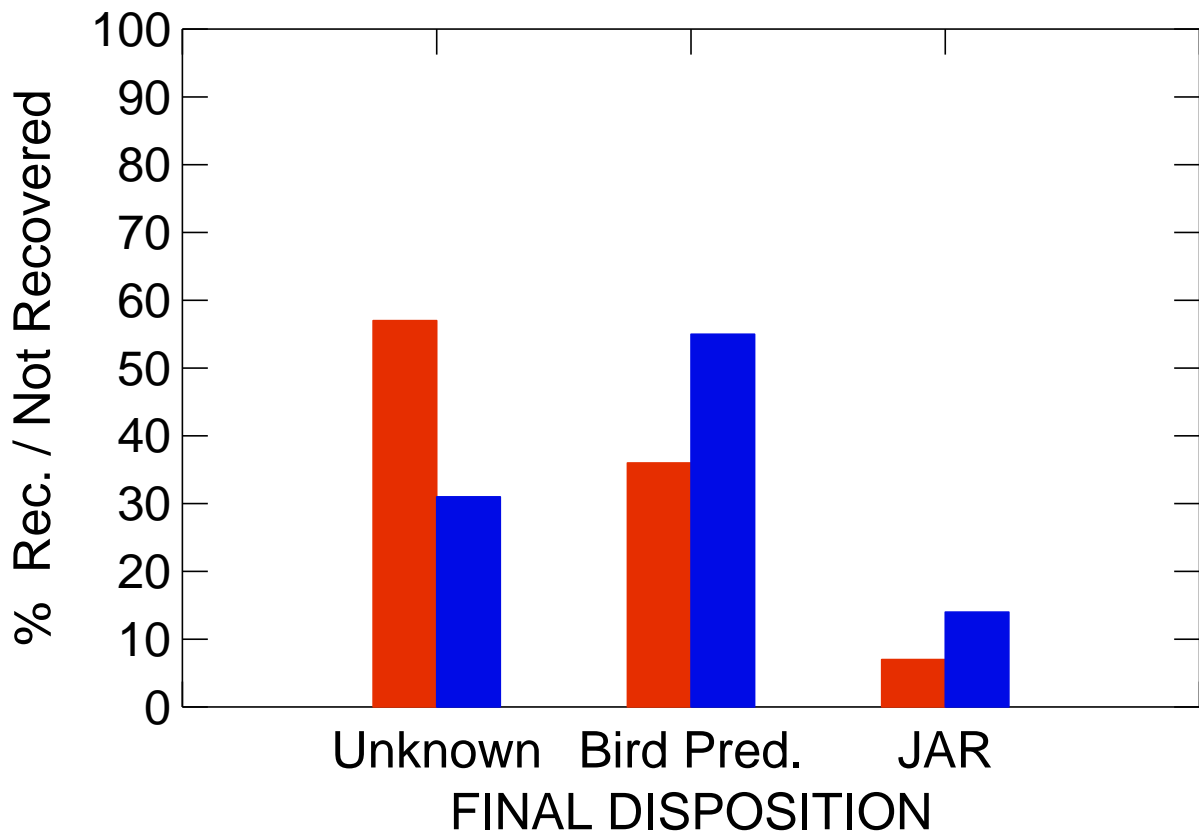


Figure 16. Disposition of Yellowstone Cutthroat Trout Passive Integrated Transponder tagged on the upper Blackfoot River, Idaho, during 2010 (red bars) and 2011 (blue bars). Yellowstone Cutthroat Trout included in the Unknown category were fish that could not be assigned to either Bird Predation or JAR categories. Fish in the Bird Pred. (Bird Predation) category were recovered from the American White Pelican nesting colony on Blackfoot Reservoir, Idaho (Teuscher et al. 2015). Fish assigned to the JAR (Juvenile to Adult Returns) category were juvenile YCT that survived to return as adults.

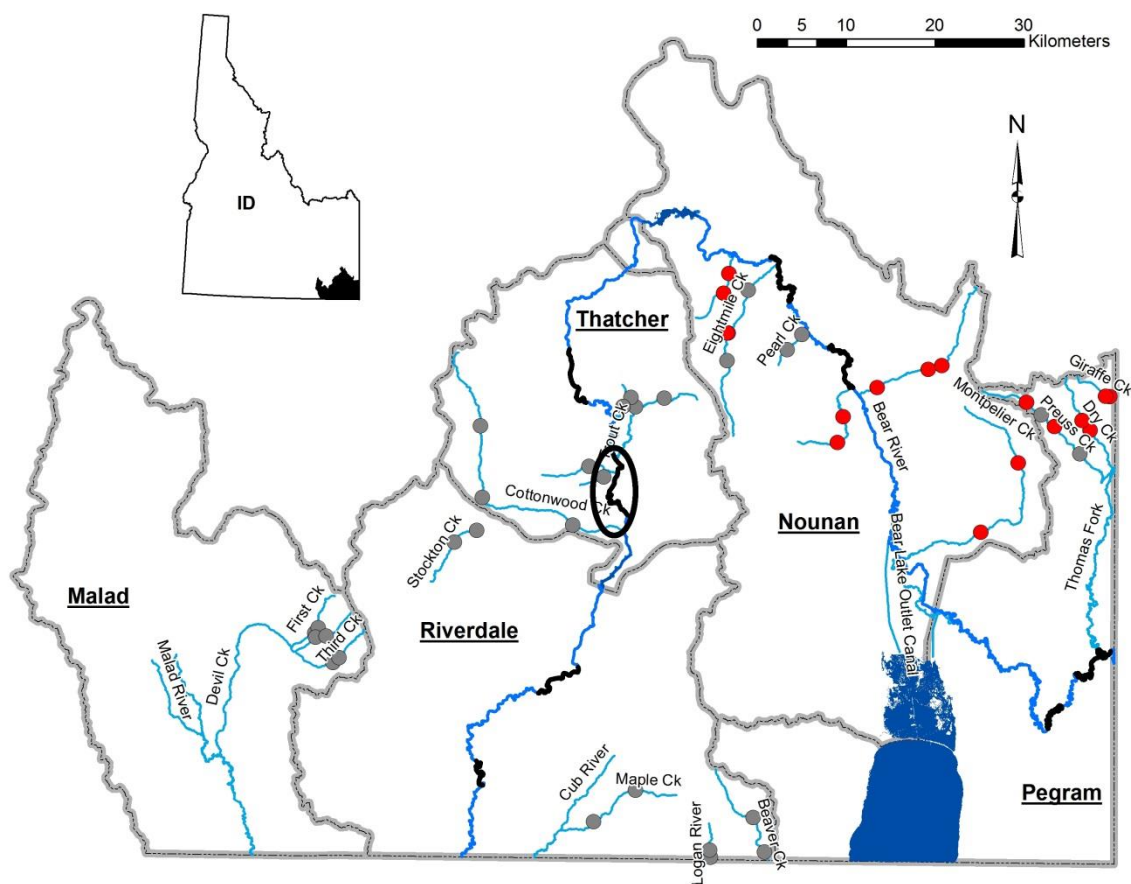


Figure 17. Map of the Bear River watershed in Idaho, including the five Bonneville Cutthroat Trout management units. The gray circles represent monitoring sites and red circles represent sites that were sampled in 2016. The black line segments on the main-stem Bear River represent monitoring reaches. The mainstem monitoring reach that is circled in the Thatcher Management Unit was sampled in 2016.

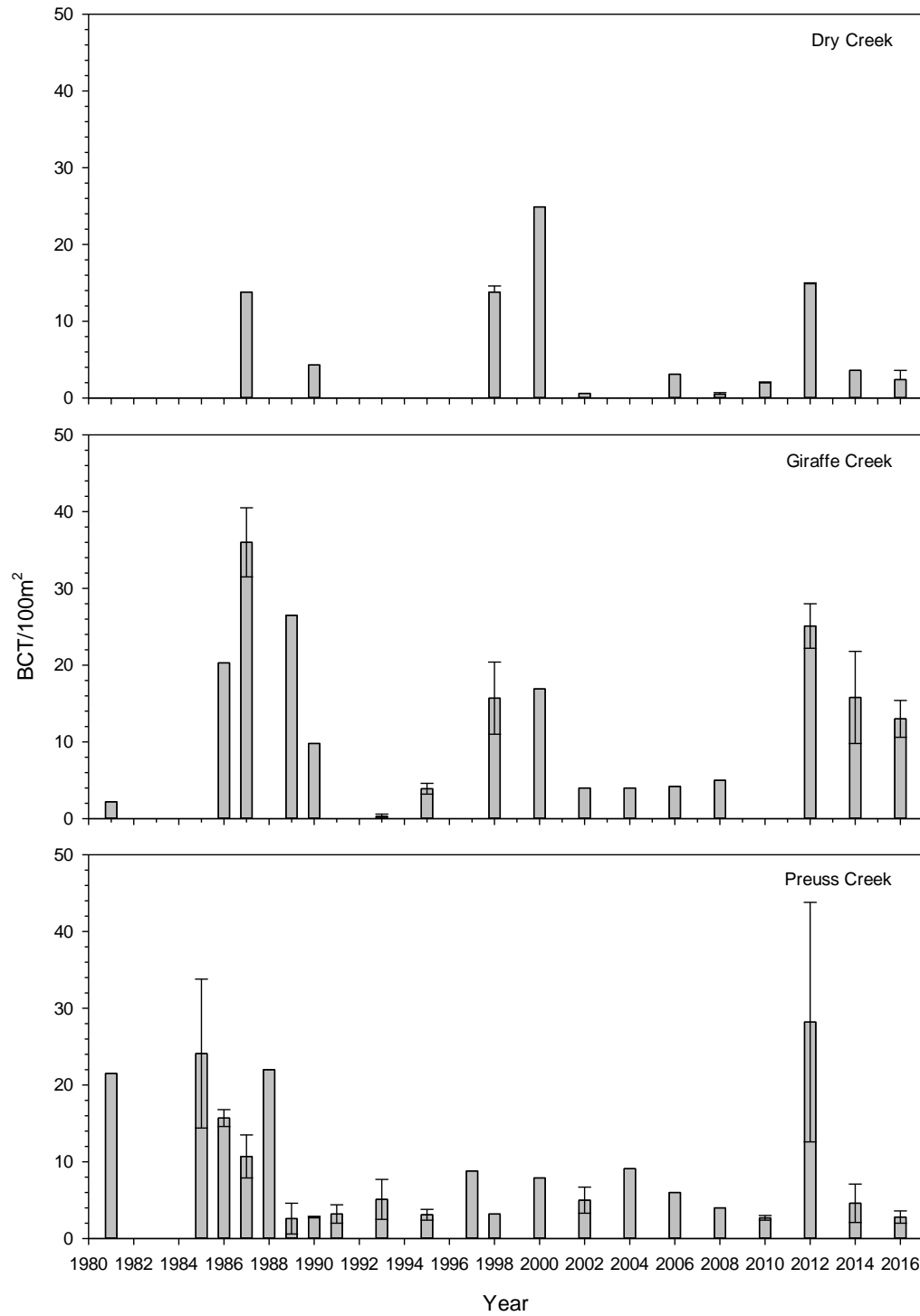


Figure 18. Mean BCT density (BCT/100m²) trends in streams located in the Pegram Management Unit. Error bars represent the standard error of the mean.

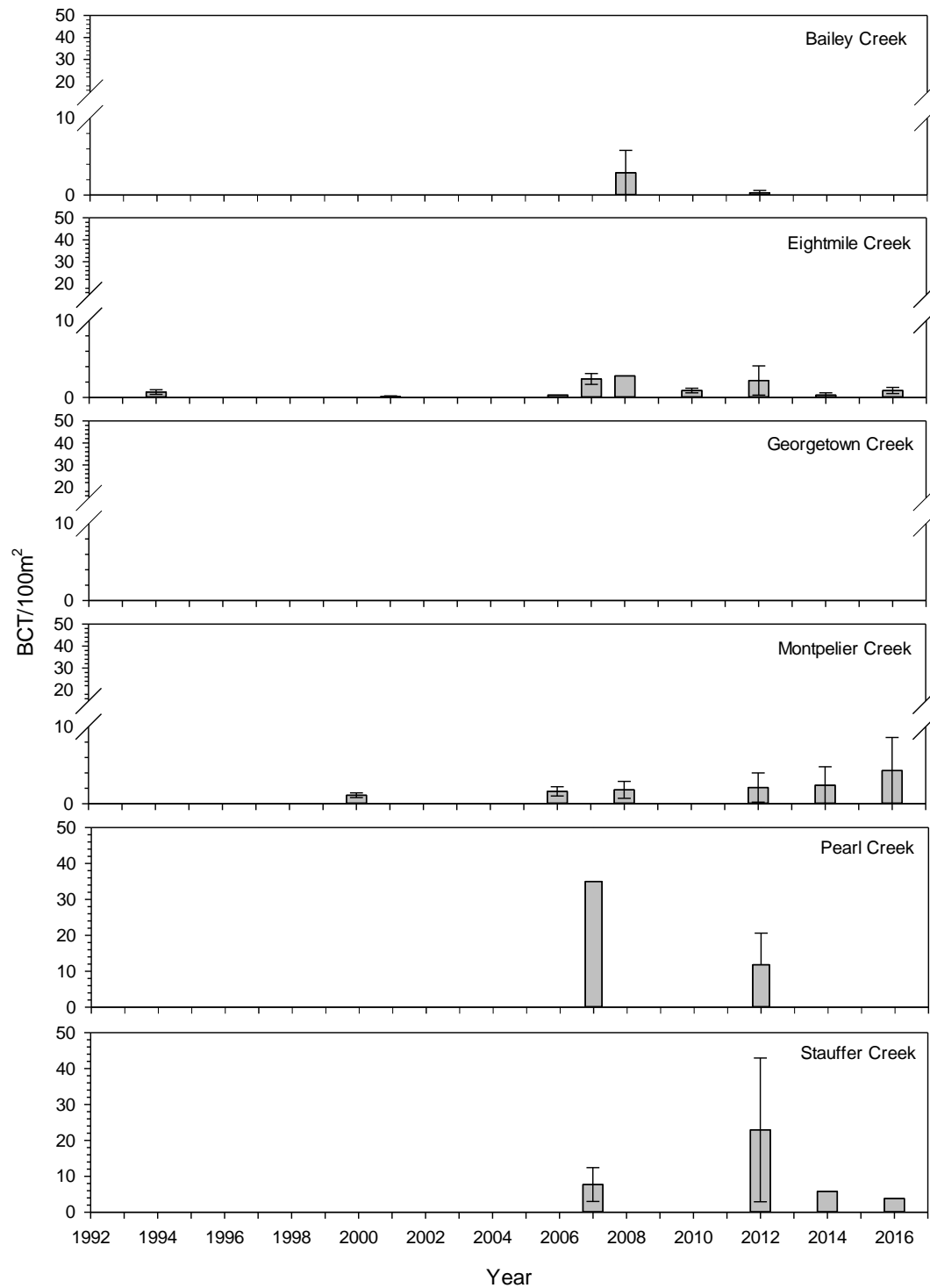


Figure 19. Mean BCT density (BCT/100m²) trends in streams located in the Nounan Management Unit. Error bars represent the standard error of the mean.

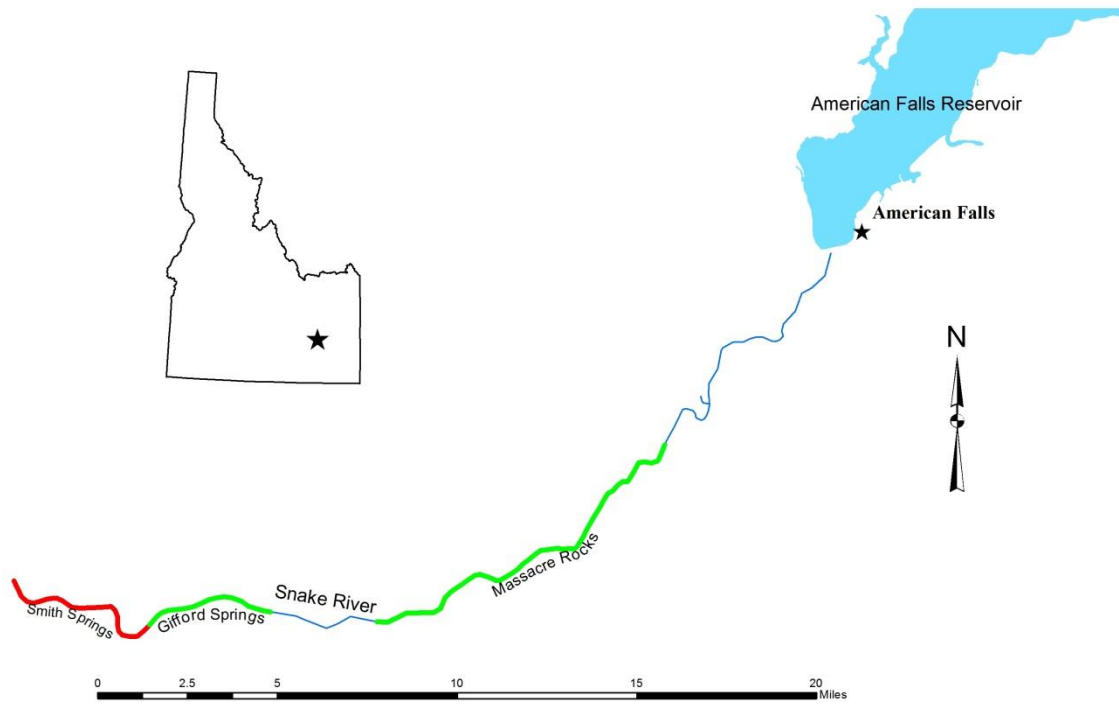


Figure 20. Locations where smallmouth bass were sampled from the Snake River near American Falls, Idaho, in 2005, 2012, and 2016 (green line). The red line indicates the area closed to boating.

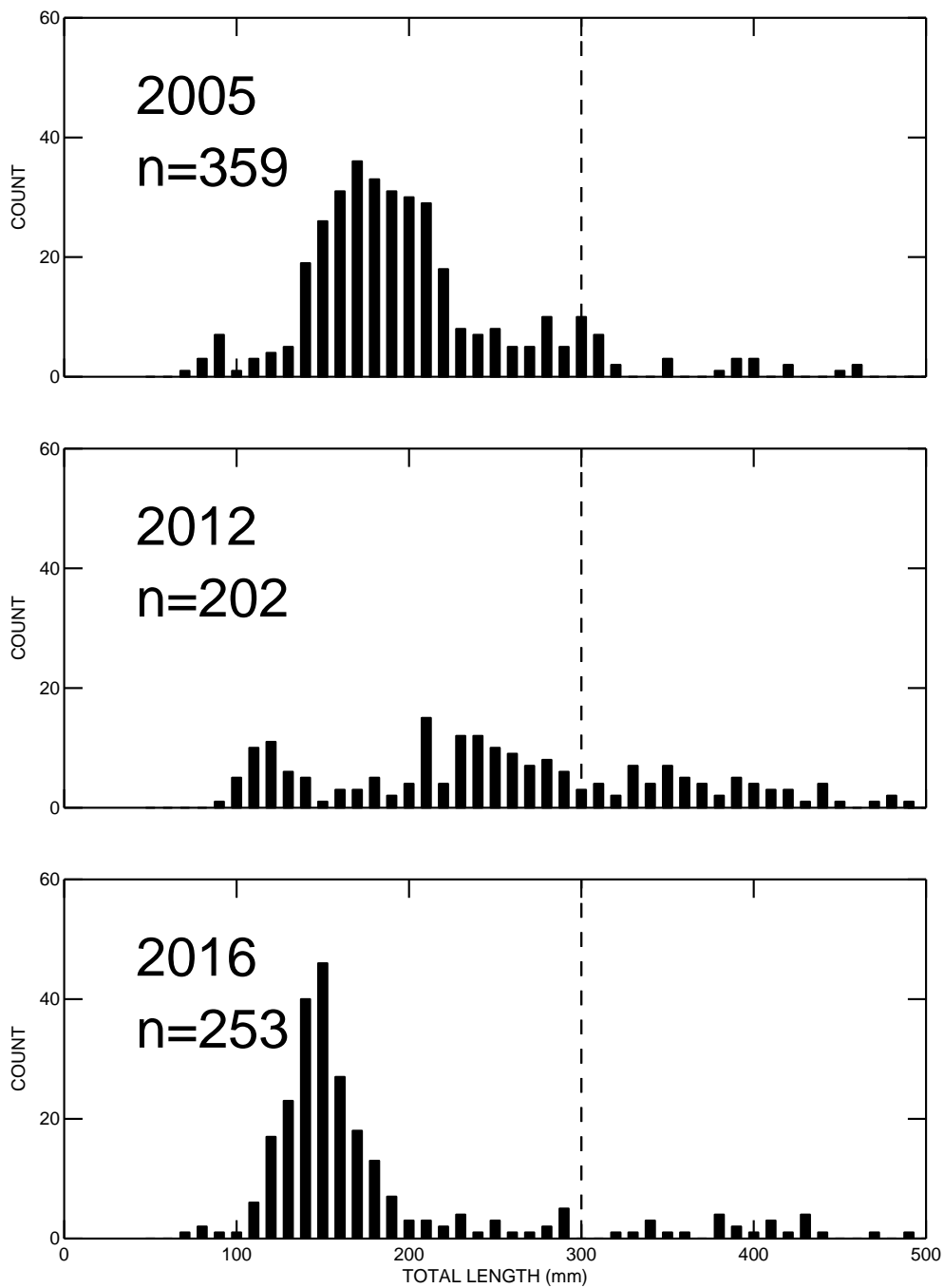


Figure 21. Length-frequency distribution of Smallmouth Bass collected from the Snake River in the open boating zone below American Falls, Idaho, during 2005, 2012, and 2016.

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